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This bimonthly bulletin reports the current literature in science and public policy. Science is used to denote engineering, technology, and other sciences. The bulletin is intended for persons engaged in studying, formulating, or implementing public policy relating to science and its use. Its purpose is to aid such individuals by alerting them to new additions to the science policy literature. The information presented consists principally of an annotated bibliographic listing of current publications in the area. Publications of a highly technical and narrowly specialized nature are excluded. The bibliographic information is presented under a number of topical categories which are (1) general, (2) science, domestic problems and national goals, (3) needs and allocation of resources for science, (4) national R and D programs, (5) science, education, and the university, (6) science management and policy making bodies, (7) science, foreign affairs and national defense, and (8) science policy in foreign countries. Each cited publication is recorded only under a single category. The numbering of publications under each category runs consecutively through all issues of the bulletin so that a given number refers to only one citation. Major meetings and other events in the subject area are also reported. (RS)

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Science Policy Bulletin

Battelle Memorial Institute

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SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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Unesco has issued 10 reports during the last 3 years on matters of science policy. This series of reports, the titles of which are presented below, "aims at making available to those responsible for scientific research and development throughout the world factual information concerning the science policies of various Member States of the Organization as well as normative studies of a general character".

No. 1 La politique scientifique et l'organisation de la récherche scientifique en Belgique, 1965 ($1.00).

No. 2 Science policy and organization of scientific research in the Czechoslovak Socialist Republic, 1965 ($1.00).

No. 3 National science policies in countries of South and South-East Asia, 1965 ($0.75).

No. 4 Science policy and organization of research in Norway, 1966 ($1.50).

No. 5 Principles and problems of national science policies, 1967 ($1.50).
Principes et problèmes des politiques scientifiques nationales, 1967 (5,50 F).

No 6. Structural and operational schemes of national science policy, 1967 ($1.25).
Schémas structurels et operationnels d'une politique scientifique nationale, 1967 (4 F).

No. 7 Science policy and organization of research in the USSR, 1967 ($1.50).

No. 8 Science policy and organization of scientific research in Japan, 1967 ($1.75).

No. 9 Science policy and the organization of scientific research in the Socialist Federal Republic of Yugoslavia, 1968 ($2.00).

No. 10 National Science Policies of the USA: Origins, Development and Present Status, 1968 ($3.50).

These reports can be obtained from:

Unesco Publications Center
317 East 34th Street
New York, N. Y. 10016

BIBLIOGRAPHY

I GENERAL

141. Reinhold, R., "A Depression for Science?", Bulletin of the Atomic Scientists, v. 24, no. 8, October 1968, pp. 4-8.

"It should become dramatically clear this year that American science is in financial trouble". A review and analysis of the budget cuts is presented and their impact on academic science is discussed. "The situation has brought to the surface a host of long-submerged but fundamental and complex questions of science and public policy. As long as there was plenty of money to go around, the science-support system has worked well". "But will the system break down under strain? Is it too inflexible to react to the vicissitudes of public mood? How can the universities ... be shielded from the vagaries of Congressional attitudes? Such are the questions the science establishment is asking itself and the answers do not come easily, because any system that is so dependent on public largesse must ultimately feel the impact of changing attitudes and national priorities". "The fortunes of American science have probably not yet reached low ebb, but it's too soon to write its epitaph".

142. Bylinsky, G., "U.S. Science Enters a Not-So-Golden Era", Fortune, v. 78, no. 6, November 1968, pp. 144-147, 197, 199-200, 202, 205-206.

"U.S. Government support for research and development increased rapidly after the Soviet Union launched its first sputnik in 1957. But the rate of expansion slowed significantly beginning in 1965, and the growth ended in fiscal 1968, when total spending declined by $200 million, or 1.2 percent, from the 1967 level. No rise in expenditures is expected for fiscal 1969. Research funds have increased faster than those for development in recent years, but not fast enough to keep up with the growing university population and the rising cost of instruments". This article discusses in detail the areas where the budget squeeze is having its most dramatic effects. The author feels that the "formulation of a new and effective approach to supporting science should begin with a reappraisal of what the nation wants from science, and how it can best get the desired results with resources that are not unlimited". "Priorities badly need to be set now that the great exponential growth of R. and D. is coming to a halt". "But a shift toward applied research at the expense of basic science

would be disastrous". "Unless fundamental inquiry is kept strong and continually renewed in strength, there will quickly be nothing to apply".

143. "Nixon Forms Advisory Panels on Science, Space, Health", Science, v. 162, no. 3859, 13 December 1968, pp. 1255-1256.

Before Inauguration Day, the president-elect "announced the creation of a host of panels to prepare reports on domestic issues for his Administration". Some of the panels included:

- Science -- headed by H. Guyford Stever, an aeronautical engineer who is president of Carnegie-Mellon University in Pittsburgh.
- Space -- headed by Charles H. Townes of the University of California at Berkeley, winner of the Nobel prize for physics in 1964.
- Education -- headed by Alan Pifer, president of the Carnegie Corporation of New York.
- Health -- headed by John T. Dunlop, professor of economics at Harvard.
- Transportation -- headed by Charles L. Miller, chairman of M.I.T.'s civil engineering department.
- Resources and Environment -- headed by Judge Russell Train, president of the Conservation Foundation, in Washington, D.C.

"The panels seem to have been issued the following general instructions: (i) to articulate issues in their field at all levels; (ii) to provide arguments pro and con on the alternative courses of action suggested; (iii) to set priorities on the actions that will be required by the Nixon Administration in each field". "Paul W. McCracken of the University of Michigan, recently appointed chairman of the Council of Economic Advisors by Nixon, is in overall charge of these task forces; Henry Loomis, a former director of the Voice of America and deputy commissioner of education in the Johnson Administration, is executive director for these groups".

144. "New President Unlikely to Alter Science Policy", Chemical and Engineering News, v. 46, no. 48, 11 November 1968, p. 17.

The new President is not likely to make an "appreciable change in science policy or level of support for research and development, regardless of his desire for change". "The reason for this probable impasse is the new Congress. For all practical purposes, the newly elected Congress is the same old Congress which wielded the economy ax so relentlessly on R&D budgets this year". In the Senate the Democrats have a "comfortable margin of control: 58 to 42. But the Senate ... has not been the prime mover in the R&D cutbacks". In the House the Republicans "gained a mere three seats and the lineup now reads: Democrats 244, Republicans 191". "The same conservative coalition which forced cutbacks in spending and cancellation of programs in the 90th Congress will again be in control when the 91st Congress convenes next year". Although

Nixon "did not positively commit himself to increasing federal support of science ... his sharp criticisms of the Johnson Administration sharply cut back support for research when the number of U.S. scientists increased by 20%". The article goes on to explain that "the big cuts ... were forced by Congress, either by the meat-ax approach ... or by positive action on appropriations for specific agencies" because of "the erosive effects of inflation".

145. McElheny, V.K., "Can Scientific Unpredictability Become Public Policy?", Technology Review, v. 71, no. 2, December 1968, pp. 10-11.

The possibility, and problems, of using the unpredictability aspect of basic research as the crux of a science policy is discussed and illustrated with examples in the areas of biology, agriculture, oceanography, and nuclear physics. "American scientists have some difficult lobbying ahead of them. In the next few years, they are likely to find themselves working hard to elevate the unpredictability of scientific results into a public policy". "In their lobbying ... the scientific community will have to stress that [scientific programs] take a long time to show their full benefits, even though there may be some short-term payoffs". The "argument in favor of a long view ... is not completely unfamiliar. Both businessmen and politicians have begun thinking about long-term conservation of natural resources for future generations. This is the type of attitude that could aid in making policy for science".

146. Snow, J.A., "Science and the Human Condition -- An Introduction", Bulletin of the Atomic Scientists, v. 24, no. 8, October 1968, pp. 24-25.

In this introduction to a group of papers presented at a symposium of the above title at the University of Illinois in November, 1967, Snow argues that "if democracy is to work in a technology-based society, then the public must come to understand technology; and the universities, at the pinnacle of the educational system, must undertake the task of developing this understanding". The ways in which science and technology influence the operations of the university are considered, and the question of whether "general science education" should emphasize content or context is discussed. Favoring the latter, Snow believes that what "is needed by the non-scientist is not an extensive understanding of the technical details of science and technology but rather an understanding of the place of science and technology in our whole culture"; the scientist, on the other hand, needs a deeper "appreciation of the social consequences of science". He feels that "the dynamics of the science-technology-society relationship is itself a legitimate new field for scholarly inquiry and teaching", and that university programs in this area "may well provide a major stimulus for change in the formal, established curriculum, while performing a major service to the nation in strengthening our understanding and control of the misuse of science and technology".

(The papers introduced by Snow's essay are "Educating for the Scientific Age", by Don K. Price; "Science as a Humanistic Discipline", by J. Bronowski; and "The World of Science and the Scientist's World", by Polykarp Kusch).

147. Price, D.K., "Educating for the Scientific Age", Bulletin of the Atomic Scientists, v. 24, no. 8, October 1968, pp. 26-32.

"What must a responsible citizen know of science?" To deal with this question, "we need to rethink the fundamental relationship of knowledge to power, of science to politics, in our society". Price examines some of the implicit theories underlying our behavior with respect to the relationship of science and citizenship, and concludes that present theories are inappropriate. He seeks a "sounder theory" through a consideration of the "parallels between the ways science has been related to the reform of university curriculums, and to the constitutional and administrative reform of the government of the" U.S. From this consideration he concludes that "we must give up relying on either Plato or Huey Long as guides to what the responsible citizen must know of science, or to our theory of the relationship of science to politics". "As for science as a branch of knowledge, the greatest obstacle to popular understanding is the ideal image of science"; instead of this, the lay citizen should try "to understand what some scientists mean when they say that their factual knowledge falls short of an understanding of reality, how they disagree and change their minds on the interpretation of the philosophical significance of science, and how they have come to have less confidence ... that ... science can solve any major problem of human values". An understanding of the special "institutional status of science in society is also necessary, especially "the right of complete freedom to deal with knowledge" without "detailed administrative and legislative controls". "If we start by looking on the sciences as humane studies ... we have made the first step toward seeing the relation of the sciences to man as a part of organized society, the political system". From this viewpoint, the first step for the layman is "to learn some substantive science", and "for scientists interested in the humane significance of their disciplines to recognize ... the political significance of science".

148. Hugh-Jones, E.M., "The Impact of Technological Change", Advancement of Science, v. 25, no. 123, September 1968, pp. 23-29.

The impact of technological change is discussed in respect to its effects on the structure of industry, employment, and distribution of income. The discussion is started with three general points: the gradualness of technical change ("some 15 years between the emergence of a technical invention and the time when it begins significantly to affect the economic or social system"); the balancing of public against private consequences of the change; and the frequent errors of prophecies in this sphere. On the question

of "economies of scale", there are diseconomies at both ends of the size scale "while between there is a long plateau where it does not seem to matter what size a firm may be". As for employment, technological change "may destroy the ... pattern of occupations ... but not necessarily ... reduce the totality of employment". However, changes do act to reduce the "job opportunities for persons who have not yet entered industry". And finally, the question of how and to what the benefits of technical change should be distributed is briefly discussed.

149. Danhof, C.H., Government Contracting and Technological Change, The Brookings Institution, 1775 Massachusetts Avenue, N.W., Washington, D.C., 1968, 472 pp. ($8.75).

This study describes the growth of government R&D contracting, how the system operates, and the issues and problems that the system creates for public policy. "In describing how the system operates, Mr. Danhof evaluates its impact on the different categories of institutions involved in government-sponsored research and development by detailing their patterns of performance. The advantages of the system ... are balanced against the questions it raises: Does the very size of the system generate an internal momentum that may enable it to elude if not completely escape control? With the heavy military emphasis of contract R&D, will the development of civilian-oriented technology be stunted? What is the effect on the traditional lines of separation between local and national authority and public and private interests? Who should own the resulting knowledge and have a right to use it? In his final chapter, Mr. Danhof emphasizes the importance of answers for these questions to a nation that is committed to the support of science and technology but is uncertain of the ultimate value of the method it has chosen".

150. "Society and Ecology", American Behavioral Scientist, v. 11, no. 6, July/August 1968, 48 pp.

The entire issue, consisting of 11 essays, is devoted to the topic of "Society and Ecology". "Although the essays display a diversity of viewpoints, on one point all seem agreed: science and technology -- controllable or uncontrollable, self-steering or governed 'from above' -- will inexorably continue to alter our environment". The main lines of argument center around the following issues: Is more and better controlled science and technology the answer to the human and social problems that it creates? Can man "jump across his own shadow and reorder his milieu under any other than the scientific-technological dispensation?" And if he can, should he? Contents include:

- Ecology and the Political System
  (R.L. Pfaltzgraff, Jr.)
- A Technology of Social Progress
  (B. Harris)

- Ecosystems, Societies, and Cities
  (S. Marquis)
- Human Ecology, Technology, and the Need
  for Social Planning (P.H. Ray)
- Global Ecology: Toward the Planetary Society
  (J. McHale)
- Technique, Institutions, and Awareness
  (J. Ellul)
- Technology and the Human Condition
  (S.T. Possony)

151. Gabor, D., "Technological Forecasting in a Social Frame", SSF Newsletter, v. 3, no. 5, August 1968, pp. 9-18.

"The potential wealth and high quality of life which science and technology can offer cannot be obtained without new social inventions and innovations". Before discussing these, the author first starts with likely 'hardware' inventions of the conventional type and then proceeds "gradually to those which will have a profound impact on the quality of life". Borrowing heavily from Kahn and Wiener's, The Next Thirty Years: A Framework for Speculation (Daedalus, Summer 1967, pp. 708-32), the author lists and comments on innovations in "Materials, Industrial Processes, Instruments", "Power", "Transport", "Data Processing and Communications", "Ocean Research and Exploration", "Space", "War", "Food", "Health and Biological Interference", and "Ekistics". The needed social inventions, "which I consider by far the most important", are presented in two groups: those that "may lead to a Mature Society" and those "for the Mature Society". The latter lists (with associated comments) "suggestions of aims rather than ... means, but even where means are suggested, it is only fair to say that in matters of social inventions and innovations the main difficulty is neither in the ends, nor in the means, but in the engineering of human consent".

152. "National Biological Congress", BioScience, v. 18, no. 10, October 1968, p. 984.

The American Institute of Biological Sciences (AIBS) will sponsor a series of annual National Biological Congresses to "focus the talents of the biological fraternity on the complex educational, social and scientific problems confronting the nation and the world". The Congresses, which will start in 1970, will include public sessions on such topics as air and water pollution, pest control, population pressures, community health, food quality, and the effect of drugs on human development and behavior. Local, state and national leaders will be invited to participate in these sessions. "In addition to the participation of national and international leaders in the biomedical sciences, younger scientists will be invited to contribute original research papers. Educational and scientific programs will be arranged for local high school and college students".

153. "Report of the Eleventh Annual Meeting of the National Research Council", National Academy of Sciences, National Academy of Engineering, National Research Council, Washington, D.C., 1968, 94 pp.

This document summarizes the proceedings of the annual meeting of the National Research Council held in March 1968. A plenary session was devoted to a panel discussion of the question: "The Dilemma in Support of Science: What Constructive Steps Can Be Taken?" Participants in this session were Philip Handler, Daniel Alpert, Donald M. MacArthur, James A. Shannon, and Gerald F. Tape. Other sessions included special reports on "Selective Service Policies and Graduate Enrollments in Science and Engineering" and "Support of Research in the Mathematical Sciences", a symposium on "beneficial modifications of the marine environment", and a progress report on the National Accelerator Laboratory. The meeting also was the occasion of a resolution, adopted unanimously by the Council, "calling for reconsideration and modification of the new selective service regulations that eliminate deferments of most graduate students".

(Copies of this publication may be obtained free from the Office of Information, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418)

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

101. Noise - Sound Without Value, Committee on Environmental Quality, Federal Council for Science and Technology, Washington, D.C., 1968, 56 pp.

This report surveys "the dimensions of the problem of noise in our society", reviews current Federal programs in the area, and makes policy recommendations for a national noise program. Sections of the report are devoted to outdoor noise (e.g. aircraft, surface transportation, construction, and industrial), indoor noise (e.g. appliances, heating and cooling systems, space layout), and occupational noise (e.g. iron and steel making, motor vehicle production, printing and publishing). Federal expenditures for noise control in fiscal year 1968 totaled approximately $11 million; almost 10 million was directed to aircraft noise problems, 1 million to health-related problems, and some $400,000 to problems of noise in buildings. Recommendations are made for future research, federal standards, intergovernmental actions, education, and federal coordination.

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price 60 cents).

102. "Lowering the Boom", Science, v. 162, no. 3857, 29 November 1968, p. 982.

"A federally sponsored panel of 12 scientists, chaired by John C. Calhoun, Jr., of Texas A & M University, has urged prohibiting all but experimental supersonic flights over populated inland areas until more is known about the public's response to sonic boom effects. The report, initiated by the Interior Department a year ago, estimated that regular overland supersonic flights could subject 20 to 40 million Americans to 5 to 50 severe sonic booms a day. In announcing the report, Secretary Stewart Udall said that 'sonic boom should be regarded as a form of environmental pollution as serious ... as water pollution,' and panel member Roger Revelle of Harvard criticized the Federal Aviation Administration for not taking adequate steps to find out what noise levels would be acceptable to the public. The report also recommends that a presidential commission be established to hold public hearings on the sonic boom and that large-scale experiments be carried out to simulate intercity commerical SST flights to learn their effects on population groups."

103. U.S. Energy Policies: An Agenda for Research, Resources for the Future, Inc., Distributed by The Johns Hopkins Press, Baltimore, Maryland 21218, 1968, 152 pp. ($5.00).

The report presents "a comprehensive approach to a study of the energy situation of the United States from the standpoint of public policy". Its intent is to enlarge "understanding, within and outside government, of the characteristics, present position, and prospects of the energy industries", and to provide "background for policy decisions". The study was undertaken at the request of the Office of Science and Technology as "a first step in carrying out the President's assignment of responsibility to that Office to coordinate energy policies on a government-wide basis". Starting from an overview of the characteristics and trends of the energy industries, the report then assembles information (e.g., industrial structure, regulatory roles of federal and state governments) for the oil, gas, coal, electricity, nuclear energy, and shale-oil industries, and closes with a discussion of an "approach to a coordinated view of energy problems". The study "includes much information and raises a multitude of important issues on energy situations and problems in the [U.S.] that should be of interest and value to ... industry, universities, ... national and state government, ... foreign governments and international organizations".

104. "Kellogg Gives $700,000 to Aid Environmental Studies Board", News Report, v. 18, no. 10, National Academy of Sciences, National Research Council, National Academy of Engineering, December 1968, p. 11.

"The W.K. Kellogg Foundation has made a five-year grant of $700,000 to the National Academy of Sciences and the National Academy of Engineering to support the work of the Environmental Studies Board". The Board was established in 1967 "to develop techniques and priorities to guide science, technology, industry, and government in protecting the environment from deterioration". The grant of the Kellogg Foundation will permit the Board "to widen its scope to include other important areas in which science and technology have a significant effect on the interaction of man with his physical and social environment". Two of the immediate tasks of the Board include: 1) "to help investigate acceptable levels of contaminants and provide advise on methods for measurement and control of pollution", 2) to "formulate significant experiments and models related to environmental quality and will assess the economic and social impact associated with proposed new directions of technology".

105. Campbell, T.H., Sylvester, R.O. (ed.), Water Resources Management and Public Policy, University of Washington Press, 1968, 253 pp. ($9.50).

This volume consists of a series of papers on the management of water resources, based on seminars sponsored by the Graduate School of Public Affairs of the University of Washington. The objective of the volume, according to the editors, in "an attempt to outline for laymen, academicians, legislators, and the public, many of the technical, scientific, and policy issues that should be considered in the management of water resources". The 15 papers of the volume deal with such topics as the nature of water law and its relationship to public policy, treatment technology and methodology for setting water-quality standards, the role of economic analysis in policy formation, cost-benefit comparisons to evaluate particular projects and the performance of particular agencies, and the implications of large-scale water transfers.

106. "Planning Underway for Anti-Crime R&D Grants", Washington Science Trends, v. 11, no. 1, 14 October 1968, p. 1.

The omnibus Crime Control and Safe Streets Act, passed by Congress last June, authorizes the creation of a new National Institute, which is the R&D wing of the new Law Enforcement Assistance Administration, will concentrate during its first year on developing an "in-house" capability for research and for coordinating funded research. The latter will include "substantial grants" covering up to 100 percent of the cost of R&D projects in such areas as advanced communications systems, crime deterrence, behavioral research into criminal activity, crime patterns and statistics, and correctional procedures. The National Institute has a $3 million appropriation for its initial year and "substantially larger funds are in prospect when it is fully staffed and operational". Ralph Siu, director of development of the Army Material Command, has been nominated by President Johnson as the first director of the Institute.

107. Collins, J.F., "Technology for the Urban Crisis", Technology Review, v. 70, no. 9, July/August 1968, pp. 19-21.

This article, by a former mayor of Boston who is now on the faculty of M.I.T., provides a general review of the problems of our cities and the contributions which technology can make toward solving them. "Studies, research, systems analysis of urban problems on a collective basis and an interdisciplinary assault by every element of the nation -- public and private, academicians, business, labor, civil rights ... all of these are required". "In approaching today's problems the states, with few exceptions, have manifested all of the mobility of the stagecoach, all of the creativity of the dinosaur". Collins cites some of the federal government efforts now being made and suggests a public-private corporate entity into which "can be channeled funds from the public sector and the private sector,

to be used by the corporation in a joint effort to identify the tasks, to reorder the priorities, and to develop plans to which the private sector can bring its systems analysis, mission-oriented problem solving potential".

108. Gregory, W.H., "Technology for Housing Stirs Hope, Skepticism", Aviation Week & Space Technology, v. 89, no. 15, 7 October 1968, pp. 100-101, 103-107, 109-110.

Progress, problems, and prospects for improving housing through technology are surveyed. Several of the current programs -- private, public, and private-public -- are described and discussed: these include three study contracts funded by the Defense Department for producing low-cost housing and the Department of Housing and Urban Development's (HUD) "In-Cities" program under which a wide range of experiments (financial, social, and technical) will be conducted in conjunction with the Model Cities projects. Efforts of industry, especially those of aerospace, are described, and some of the "highly practical, perhaps insuperable obstacles" to bringing technology to housing are discussed and illustrated. Among the obstacles cited are: "Technical feasibility does not mean cost feasibility"; "Advanced technology offers no assurance of livability in housing", nor of acceptability; "easily movable housing ... could destroy the real-property tax structure on which urban government largely depends"; and opposition from building trade unions. Finally, the policies and role of HUD in fostering the application of technology are discussed.

109. "Housing Agency Looks to Science for Help on Urban Problems", Scientific Research, v. 3, no. 23, 11, November 1968, p. 23.

"The Department of Housing and Urban Development (HUD), one of the newer federal agencies, is trying to find out where to put its growing research dollars -- and is getting some help from the universities. Nine major universities have just completed a series of studies for HUD on how science and technology might be brought to bear on the problems of the cities. And the National Association of State Universities and Land-Grant Colleges, headquartered here, is putting together a task force to better define university responsibilities in the cities. HUD's director of research and technology, Thomas F. Rogers, says the systems approach that got America into space is the only way to solve housing and other urban problems, and he'll be looking to industry, as well as to the universities, for help".

110. "Privacy and the National Data Bank Concept", House Report No. 1842, Committee on Government Operations, House of Representatives, Ninetieth Congress, Second Session (August, 1968), U.S. Government Printing Office, Washington, D.C., 1968, 34 pp.

This report summarizes the findings and conclusions of the Special Subcommittee on Invasion of Privacy which was convened to study the "potential erosion of the citizen's right to privacy that might be the ultimate result of the proposed National Data Bank". Commissioned reports on this topic, as well as the Subcommittee's hearings, are summarized. The report notes that the "creation of dossiers by means of such systems poses a grave threat to the constitutionally guaranteed rights of each American", but at the same time "we must recognize the value and legitimacy of property safeguarded computerized data systems containing limited personal information for limited and specific aims, such as those used separately and noninterchangeably for medical records, social security records, military records, and for law enforcement purposes". The Subcommittee recommends that: "no work be done to establish the national data bank until privacy protection is explored fully"; the Bureau of the Budget formulate "specific proposals for a national data bank"; an "independent supervisory commission" be established for regulating the data bank.

111. Sawyer, J., and Schechter, H., "Computers, Privacy, and the National Data Center: The Responsibility of Social Scientists", American Psychologist, v. 23, no. 11, November 1968, pp. 810-818.

The proposed National Data Center "may be the single most important information resource social science has so far known, and it may also be the most significant step yet in technology's vigorous assault on personal privacy". The conceptual origins of the center are reviewed, and the engendered proposals and congressional hearings are surveyed. This is followed by an appraisal of the research potential of such a center, and an examination of the threats to privacy and the necessary safeguards. "The major advantages a national data center holds for research are that (a) more data will be available, (b) data will be available more cheaply, (c) data will be available for more and better sampled respondents, (d) data collection will be less redundant, (e) variables will be more comparable, (f) variables will cover more areas, and (g) analyses will be easier to verify". The major threats to privacy result from the need to individually identify each record, and from the possibility of erroneous information becoming a part of an individual's record. "The essential goal of the safeguards is to prevent its use to evaluate individuals". Several safeguards are suggested toward this end.

112. "State Tech Services Slumber On", Industrial Research, v. 10, no. 9, September 1968, p. 26.

The Commerce Department's Office of State Technical Services, which is responsible for stimulating the flow of government sponsored R&D to industry, "is alive for another 3 years. But it is nowhere near as healthy as supporters inside and out of the federal government would have liked". The original 1965 act establishing the Office was recently extended for another 3 years by President Johnson. But in spite of the many witnesses that appeared before the Senate Commerce Committee urging more money for the program, only $6.6 million will be available to the Office in 1969; some $10 million is expected for each of the fiscal years 1970 and 1971. In the first 3 years of the program, Congress authorized $10-, $20-, and $30-million for the 1966-1968 fiscal years, but appropriated only $3.5-, $5.5-, and $6.5-million, respectively, for its operation. Supporters of the program are encouraged by the growing state participation: all states now take part in the program and almost all have requested annual study programs.

113. "NSF Backs Pilot State Science Policy Study", Chemistry and Engineering News, v. 46, no. 54, 23 December 1968, pp. 29-30.

The first state science policy study in the United States is being funded by the National Science Foundation (NSF) through a grant of $85,000 to the University of Tennessee. The NSF grant will be supplemented by additional funds from the State of Tennessee ($42,000), the Tennessee Valley Authority ($15,000), and NASA ($10,000). The project calls for a study of "how the states might best use science and technology in economic and social problem areas". Its aims are to: "describe existing government mechanisms and policies for social and technological innovation in the state"; "identify and appraise factors influencing the structure and innovative capacities of state socioeconomic institutions"; "appraise from the state's viewpoint the relevant federal programs and processes that affect the state and its communities"; "explore ways to link public and private organizations with technological information and activities"; "make recommendations on which the state can act to formulate and implement a science and technology policy". The study is part of an NSF program to "assist state and local governments to develop better policies for using science and technology and to reinforce the federal-state science programs of other federal agencies by strengthening the state and local end of the partnership".

114. "Background Study Report for the Conference on Science, Technology and State Government", Louisville, Kentucky, September 19-20, 1968, 53 pp.

"This report is intended as a pre-conference reference document for participants in the Conference on 'Science, Technology and State Government'". Its purpose is to present current information

on science and technology programs being conducted at the federal and state levels, problems and issues confronting both the public and private sectors in utilizing science and technology for economic and social progress, and opportunities for federal, state, and local action". The report, prepared by the Southern Interstate Nuclear Board for the National Science Foundation, includes the following articles and information:

- Science and Technology in State and Local Affairs
- Science and Technology Programs of the State of Kansas
- Kentucky Science and Technology Programs
- Louisiana Science and Technology Programs
- Science, Technology and Pennsylvania
- Federal Programs

(Copies of the report may be obtained from: Mr. M. Frank Hersman, Office of Planning & Policy Studies, National Science Foundation, Washington, D.C. 20550)

115. "Lake Erie Report. A Plan for Water Pollution Control", U.S. Department of the Interior, Federal Water Pollution Control Administration, Great Lakes Region, August 1968, 107 pp.

"The cleanup of Lake Erie is less a problem of engineering than it is a problem of diverse, inadequate, and unwieldy changing governmental policies, funding, and management. The technical engineering methods of waste control are known or close at hand with the main requirement being only their coordinated application. As an international and an interstate body of water, management involves two national governments, five state governments, one provincial government, and a multitude of local governments". "This report recommends a plan of action, combining intermediate and long-range needs. It describes the pollution problem and the ominous threat of continued pollution. It also describes what must be done to save Lake Erie, who will take these actions, and how much it will cost".

116. "NAS Medical Board Embarks on Two Major Studies", Scientific Research, v. 3, no. 16, 5 August 1968, p. 19.

"The National Academy of Sciences' new board on medicine has decided to tackle, in its first major studies, two of the most difficult problems facing medicine and society today. The first study will take a broad, fundamental look at medical education for the future -- not at curriculum development or lack of classroom space, but at the ways in which medicine fits into society and how medical education might be reshaped from top to bottom to meet new needs. The second study will concern health services for the poor: How and why do they differ from health services for other segments of society? What services are needed? How might behavioral attitudes be changed -- either by the poor or by the doctor -- to eliminate these differences?"

117. "Engineers and Physicians: Toward a Meaningful Collaboration", News Report, v. 18, no. 10, National Academy of Sciences, National Research Council, National Academy of Engineering, December 1968, pp. 8-9.

During a recent meeting at the National Academy of Engineering [NAE], engineers and physicians discussed "ways in which technology can be applied more vigorously to the problems facing the medical profession in modern society". "Much of the symposium revolved around the role of the university in biomedical engineering. This is an area of great activity by the NAE, which has issued six subcontracts to seven universities to develop prototype programs for bringing engineering and medical capabilities into greater association. All seven were represented at the discussion. The consensus seemed to be that if engineering is to be meaningful to society, it must become involved in health care, and if it is to become involved in health care, universities themselves (which employ much of the high-level technological competence) must adopt a greater responsibility toward directly serving the needs of society". "There was much talk about inherent dissimilarities and communication gaps between the doctor and the engineer ..., but the overall impression was that there are extremely fruitful opportunities ... for collaboration between the medical and engineering professions to the benefit of society's general level of health".

118. "First Pollution Suit", Science, v. 162, no. 3855, 15 November 1968, p. 778.

"The U.S. government has won its first suit to abate interstate air pollution under provisions of the Federal Clean Air Act of 1963. The Justice Department charged a Bishop, Md., animal rendering plant with discharging pollutants into the air across the Delaware state line. The judgment provides the Delaware state pollution director with the authority to declare that pollutants are crossing into his state. When this occurs, the Justice Department may issue a court order to close the processing plant immediately".

119. "A DDC Bibliography on Cost/Benefits of Technical Information Services and Technology Transfer", Defense Documentation Center, AD 672 500, July 1968, 80 pp.

"This bibliography is a compilation of literature existing in both the government and public sectors and concerning Cost/Benefits of Technical Information Services and Technology Transfer. Not only was the cost-benefit to the user reflected, but consideration was given to the initial cost of information collections, the cost of processing the information and the cost of the flow of this information to the user. Cost-benefit was therefore considered as communication from one field to another for practical use of technology. The 218 Unclassified-Unlimited references are divided into two parts: Technical Information Services and

Technology Transfer. Each part is arranged into four sections by source: DoD; Federal (non-DoD) and state services; Commercial and non-profit organizations and universities, and General. Within each source, the references are arranged in chronological order. Three indexes, Corporate Author, Personal Author and Title, are appended".

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

95. "Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1967, 1968, and 1969", Surveys of Science Resources Series, National Science Foundation, v. XVII, August 1968, 259 pp.

This report, the 17th edition of the Federal Funds series, is divided into four major sections: funds for research, development, and plant; funds for collection of general-purpose scientific data; and statistical appendices. The first major section presents data and information regarding "levels and trends", "basic research", "applied research", "development", "performers", "agencies", "R&D plant", and "foreign performers". The following two sections briefly describe the characteristics and activities of the efforts involved in acquiring and disseminating technical information. Federal obligations for all R&D (plant excluded) "totaled $16.5 billion in fiscal year 1967 and were expected to total $16.2 billion in fiscal year 1968 and $17.3 billion in fiscal year 1969. The estimated drop in 1968 obligations represents the first time since 1955 that total R&D funding has decreased from the preceding year. The 1969 R&D total will probably be even less than the 1968 total -- not more, as had been expected -- as a result of subsequent appropriations and apportionment actions".

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price $2.00).

96. "Research and Development in Industry, 1966", A Final Report on a Survey of R&D Funds, 1966, and R&D Scientists and Engineers, January 1967, Surveys of Science Resources Series, National Science Foundation, June 1968, 134 pp.

"This report on industrial research and development is the 12th in a series extending back to 1953. Over this period, industrial R&D expenditures have increased fourfold into an almost $16 billion endeavor, thereby becoming one of the major contributors to the Nation's economic growth. As in previous years, the 1966 survey of industrial research and development was sponsored by the National Science Foundation's Office of Economic and Manpower Studies .... Data contained in the survey were collected and compiled by the Bureau of the Census, U.S. Department of Commerce". Some of the highlights of this report include: "In 1966 industry accounted for about 70% of the Nation's R&D performance". "Total 1966 industrial R&D expenditures amounted to $15.5 billion". "Federal Government R&D work performed in industry reached $8.3 billion, or 53 percent of the industrial total, with the remainder coming from companies' own funds". "In January 1967, 163,900 industrial scientists and engineers ... were engaged in R&D programs directly supported by the

Federal Government. They accounted for about 30 percent of the total R&D scientists and engineers in the economy". "In 1966, two agencies, NASA and DOD, financed the work of 89 percent of all R&D scientists and engineers employed by industry on Federal projects".

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 -- Price $1.25).

97. "IBRO Survey of Research Facilities and Manpower in Brain Sciences in the United States", National Academy of Sciences, Washington, D.C., 30 June 1968, 314 pp.

A worldwide survey of research facilities and manpower in the brain sciences was initiated by the International Brain Research Organization (IBRO), sponsored by UNESCO, and financed by the National Institute of Mental Health. This survey is one of the 37 completed for individual countries. "The specific purpose of the IBRO survey has been to identify scientists and their research interests -- who is doing what, and where -- in fields relevant to brain and behavior". The scope of the basic brain sciences is determined by its eight membership categories in neuroanatomy, neurochemistry, neuroendocrinology, neuropathology, neuropharmacology, neurophysiology, neurocommunications and biophysics, and behavioral sciences. "The survey contains information on 4245 researchers furnished by 880 respondents in 573 organizations". Each program is briefly described as to research interest, department in which research is being done, and the researchers involved. These descriptions are grouped by states and cities. Appendices include a brief description of "federal support of brain sciences", statistical data on types of organizations in which research is conducted, and the distribution of specialties. Organization and investigator indexes are also presented.

98. "Mathematics: More Funds Urged for Science's 'Leading Wedge'", Science, v. 162, no. 3856, 22 November 1968, pp. 883, 885.

This article reviews a recent National Academy of Sciences report on the conditions, prospects, and needs in the field of mathematics. The authors of the report "contend that mathematics is entitled to special treatment. In their view, not only should federal support for graduate students and academic research in mathematics be increased at 16 percent a year, overall, for some time to come but this rate of growth should not be reduced until the growth rate for other sciences which depend on mathematics has been cut back". The report, prepared by the Committee on Support of Research in the Mathematical Sciences (COSRIMS) calls for an annual growth rate "of 24 percent for research apprenticeship, as against a rate of 14 percent for research". According to the report, American mathematics is now in a position of world

leadership in the field; there are more first-rate mathematical centers in the U.S. than in the rest of the world. "Mathematics has fared tolerably well in the competition with other sciences for able students, but ... far fewer Ph.D.'s have been conferred in mathematics than in other fields". This disparity is discussed, as well as the separation of pure mathematics from other scientific areas.

(The report, The Mathematical Sciences: A Report, Publication No. 1681, may be obtained from: Printing and Publications Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 -- Price $6.00).

99. "Panel Urges Increased Support for Solid State Research", Washington Science Trends, v. XXI, no. 4, 4 November 1968, p. 1.

"A National Academy of Sciences Panel has warned that solid-state research in the U.S. has reached a critical point which can only be overcome with increased support. This support ... should be in the field of 'truly basic, undirected research' with the emphasis on people working in small groups, 'rather than in costly installations and facilities operated by teams". The Panel pointed to data which showed "no increase in Federal support of basic research in universities in either solid-state physics or materials science between Fiscal 1966 and 1967, with an estimated 7% loss in support the following year". The role of the solid-state sciences in technology related to such national problem areas as pollution abatement, public transportation, urban renewal, health and safety, and communications have been outlined by the Panel. Several basic research opportunities are also discussed.

(For sale by the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 -- Price $3.50).

100. "Coordinated Programs Urged for Studies of Near-Earth Space", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XVIII, no. 9, November 1968, pp. 1-3.

The National Academy of Sciences' Space Science Board recently issued a report, "Physics of the Earth in Space: A Program of Research, 1968-75". Its central recommendation is for a coordinated program of satellite, space probe, and sounding rocket missions to study questions of fundamental physical mechanisms of the Sun-Earth system. The report: 1) "examines in detail the current state of knowledge about the Sun, the interplanetary medium, the magnetosphere ..." 2) identifies major scientific questions, such as, "How is the solar wind energy converted into electric currents, auroral light, and radiation belts?" "What causes geomagnetic storms and what are their effects on the

magnetosphere and ionosphere?"; 3) "outlines a specific program of recommended missions ... that would provide coordinated, simultaneous spacecraft observations"; 4) "recommends the development and use of two new types of space vehicles: clusters of simultaneously deployed small satellites to permit simultaneous measurements at relatively short separation distances and Atmospheric Explorer satellites with variable orbital capabilities for measurement at lower altitudes". The Board urged "greater coordination among individual experimenters" and suggested "means of achieving this goal".

101. "Will Scientists Soon Be A Surplus?", Business Week, no. 2043, 26 October 1968, p. 81.

Congress' edict that federal personnel ranks be rolled back to their level of June 30, 1966 will have several effects. "Nearly 6,000 civilians will be pared from the payrolls of Navy and Air Force research laboratories by next June 30 -- many of them scientists and engineers". "The Navy plans to shed by attrition 500 of its ... work force" and the "Air Force has been ordered to trim 3,489 from its current civilian research team". "Aerospace is the industry most conspicuously affected so far": 'Our attrition rate (loss of staff, mainly to other companies) has dropped 50% in the last three months. That ties in directly with the space-Pentagon budget problems. And it means other people are not hiring'". The Boeing Company anticipates cutbacks early in 1969 among 4,200 employees at the government-owned Michoud plant in New orleans. NASA plans to reduce its employment nationwide by 1,600 and another 2,000 from NASA contractors. But moving in the opposite direction is the Atomic Energy Commission which plans to add 2,500 personnel, "most of them as a result of a productive start on the ... Sentinel anti-ballistic missile program". "Despite the possibility of a scientist surplus in the U.S., there is a prospect of a growing shortage of PhD's for industry". "Behind this prospect are two factors -- the pressures of the draft on graduate students and the cutback in government research grants". H.G. Stever, president of Carnegie-Mellon University says, "A one-year cut ... is not ... terribly serious ... but if the cuts continue long-term, our ability to produce researchers for industry will drop off".

102. "Science Budget Pains: Just a Twinge?", Washington Science Trends, v. 20, no. 23, 16 September 1968, p. 1.

"Federal science support will continue in about the same proportions and fiscal levels over the short run, although priorities may continue to change", according to W.D. Carey, Assistant Director, Bureau of the Budget. "He reminded those voicing anguish about constraints on the science budget that aggregate Federal expenditures for R&D in the Fifties amount to about $35 billion, while the total in the Sixties is in the range of $150 billion": 'This puts austerity in a different light'. The basic problem,

contends Carey, is that "there has been no strategy developed for the uses of science to society, and investment alternatives are subject to opportunism and political pressures'. "Carey has advocated systems for relating social contributions of science and technology to costs, and has suggested that institutional changes might be needed to focus on analysis, criticism, forecasting, evaluation and planning".

103. "NIH Officials Expect Average Grant Cuts of 10-15 Percent", Scientific Research, v. 3, no. 20, 30 September 1968, p. 19.

"Informed sources at the National Institutes of Health say they are figuring on an average 10-15 percent cut in their spending for grants this year, even if they get pretty much what they requested from Congress for their fiscal '69 budget. Since the Administration has to cut spending by some $7 billion this year -- regardless of congressional action on the various appropriations bills -- NIH has no choice but to cut its spending. NIH officials have been negotiating on a grant-by-grant basis with all grantees in order to get a feel for how much can be chopped out of each project. Some cuts may run as high as 35 percent; others will be zero. The average cut, NIH officials are advising grantees, will probably run between 10 and 15 percent. As with other granting agencies, NIH may have to be particularly hard on new grantees, because of the difficulty in shutting off current research that looks promising. However, highest priority in apportioning funds is being given to faculty and student support, lowest priority to replacement of equipment, agency officials report. Education will suffer the smallest cuts because of congressional pressure to produce more medical and paramedical manpower. On the other hand, large-cost equipment grants and construction funds will, in effect, be eliminated".

104. "NSF Spending Limit Disrupts Research", Scientific Research, v. 3, no. 22, 28 October 1968, pp. 17-18.

The results of a Scientific Research Survey on the effects the National Science Foundation's budget cuts are having on six major universities are reported. As a result of the cuts, big grantees were limited to spending 75-85 percent of the money allotted them this year, and retroactive to July 1. "Much of the money had either been already spent or irrevocably committed before the ruling was announced. As a result, drastic cuts are being made in the only areas available -- usually research projects and graduate traineeships; planning has been disrupted, and new sources of funds are being desperately sought". The following situations exist at these six universities: University of Georgia, "originally counted on ... $3.1 million from NSF ... now limited to ... $2.1 million" -- the cut has "wiped out physics"; Stanford University, "faces a $2.0 to $2.5 million cut in its $10 million ... and will go $700,000 or more into the red" this year; Berkeley, spending on more than 300 NSF grants "will now

be reduced from about $9 million to $7.055 million this year"; University of Chicago, " ... the most drastic aspect of the cut is that we're considering closing down the cyclotron"; University of Michigan, after receiving NSF's ceiling, "We found that we had spent one-third of the ceiling amount for the year" in the first two months of fiscal 1969.

105. "NSF 'Rescue' Fund Augmented", Science, v. 162, no. 2356, 22 November 1968, p. 880.

"Informed Washington sources report that the Bureau of the Budget has recently ruled that NSF can increase its spending during fiscal year 1969 by about $17 million above the previously announced ceiling of $462.5 million. As a result, NSF will have considerably more money available to alleviate sharp distress caused in the scientific community by this year's budget cuts". "The Foundation has already adjusted the ceilings of about 50 institutions by a total of a few million dollars in order to alleviate extreme hardship, or remedy clear injustice. Such adjustments have been made in cases where (i) NSF clearly made a computational error in calculating an institution's ceiling; (ii) an institution had already spent more than its ceiling allowed, and the institution would thus have 'owed' NSF money (these are generally small institutions); and (iii) unusual circumstances, such as a large construction program or an abnormally high rate of growth, made it unfair to treat an institution in accord with a nationally applied formula". "NSF has received almost 200 appeals from institutions requesting increases in their spending ceilings. The increases sought range from a few thousand dollars to the $1- to $2-million level".

106. "More Defense Dept. Money for Research", Scientific Research, v. 3, no. 22, 28 October 1968, pp. 17-18.

"An increase of 10-15 percent over fiscal '68 -- is the outlook for fiscal '69. The final appropriation figure for DOD research, development, test and evaluation is $7.551 billion ($8.006 billion was requested), as compared to only $7.108 billion last year. The research and exploratory development segments of the budget have yet to be determined by the DOD, but research (where most university money is) will probably be up 10-15 percent over last year's $371 million; exploratory development will be about the same as last year's $948 million. No spending limit will be put on DOD '69 appropriations. Any cuts that are made will be in foreign research, social sciences research, engineering, and analyses. Project Themis gets $28.5 million (as against $36 million requested), enough to continue all 92 existing contracts and to fund 20-30 new ones (40-50 new starts had been planned). The new starts are subject to approval by the House Appropriations Committee -- hoped for in late October or early November".

107. "No Relief in Sight for R&D Fund Cuts", Chemical & Engineering News, v. 46, no. 50, 25 November 1968, p. 9.

"In spite of scientists' laments over cuts in research and development funding from the Federal Government, signs are that relief is not due soon. The reason increasingly being given is not the pressure of extraordinary budget items such as the war in Vietnam but weaknesses in R&D itself -- overdependence on the Government, hazy priorities, and irrelevance to the country's most pressing projects, which fall more and more in the social realm". In evaluating the prospects for R&D support, William D. Carey (Assistant Director of the Budget Bureau) underscored the dim prospects for future R&D money from Washington". He believes that we "are in a holding pattern that's probably going to last a while. Unless a great new urge like the race to the moon takes hold, federal money for R&D won't rise"; that R&D should be justified on the basis of its social return; and that a center examine the interaction of science with the economy to formulate models for investment ("to make a small, harmless start in planning science").

108. Boffey, P.M., "Budget Paradox: Spending Holds Even, Yet Researchers Are Hurt", Science, v. 162, no. 3851, 18 October 1968, pp. 340-342.

Budget cuts (meaning "reduction from the level of support proposed for fiscal 1969, not from the level actually maintained the previous year") has researchers complaining that their "ability to do effective research is undermined": "The explanation of how a level budget can cause problems lies partly in the fact that the cost of research keeps going up and therefore more money is needed just to keep even, and partly in the fact that this year's budget crunch has fallen much more heavily on some agencies and scientists than others". "The National Science Foundation (NSF) and the National Institutes of Health (NIH), where research is the prime activity, have both had to scramble hard to implement cuts without paralyzing the scientific community". One method employed by both NSF and NIH is to impose spending ceilings on grantees. "This year's budget stringencies stem from the fact that Congress, as a price for approving a tax increase sought by the Johnson Administration required deep cuts in the President's proposed budget for fiscal year 1969 ... to comply with the Congressional mandate, the Bureau of the Budget has been assigning ceilings to the various federal agencies limiting the amount of money they can spend or commit. NSF stresses that 'no grants will be cancelled nor will the amount of any award be reduced; rather the intent is to extend the time for completion of the work supported by grants'. The spending ceilings ... will 'force an overall reduction of about 20 percent in the level of expenditures that would normally have been incurred in the conduct of research and education programs'".

109. "R&D Managers Look Into Funding", Scientific Research, v. 3, no. 23, 11 November 1968, p. 21.

"The northeastern section of the Society of Research Administrators is considering whether it should recommend to the full Society some sort of political action on federal funding of science. Society members handle many federal research grants and contracts. 'The scientific community needs a lobby in Washington, but it would be presumptuous for the research administrators to be that lobby', said John Philips, research administrator at the Cold Spring Harbor Laboratory of Quantitative Biology and chairman of a 4-man committee that will look into the funding crisis for the Society. 'There is an education job to be done', Philips continued. The Congress needs to know what is going on [in science] when it acts on the budgets. I am sure that members of the Congress are not certain of the difference between basic research and applied research and development. Anything our group can do to bring these people together with scientists for an exchange of views would be all to the good, for there is a problem of scientists relating to the politicians, too".

110. "Scientists Fear Revival of Mansfield Bid", Chemical and Engineering News, v. 46, no. 46, 28 October 1968, pp. 30-31.

The "parting shot at federal support of scientific research" by the "cantankerous 90th Congress" came in the form of a proposed amendment to the fiscal 1969 Department of Defense appropriations bill which would have "imposed a 25% ceiling on indirect cost, or overhead allowance, on all DOD-funded research grants and contracts". "That the amendment was subsequently killed by House-Senate conferees has done little to relieve the anxieties of many members of the scientific community. The fact that the amendment won Senate approval by the margin it did (47 to 19), they feel, is reason enough for concern". Further, Senator Mansfield, who introduced the amendment, has "promised that more will be heard on the matter when the next Congress convenes". "Moreover, the Mansfield amendment appears to be merely the tip of an iceberg of Congressional suspicion, misunderstanding, and hostility" toward R&D. The "roots of Congressional disenchantment with the federal research effort go far deeper than over-head costs". Some of these roots are cited and illustrated in the article. "All in all, 1969 shapes up as a crucial year for science in the legislative scheme of things".

111. "No Cutback in Industry-funded Research", Scientific Research, v. 3, no. 23, 11 November 1968, pp. 11-12.

Support by private industry of research has not been affected by government cuts, according to a survey of top executives in electronics, aerospace, chemical, and pharmaceutical firms. The following major points were brought out in the survey: (1) in-house funding levels increased slightly or remained stable. "Virtually

without exception ... expenditures for fundamental research remain a constant fraction of their total R&D spending ... in the range of 3 to 15 percent"; (2) "the elimination of government-sponsored projects has made it easier for them to recruit top-quality scientists"; (3) some companies have been hurt by Defense cuts, mostly the small, specialized companies, but "large companies have been able to add enough corporate funds to hold their essential research staffs"; (4) "virtually every company ... said it was giving substantial support to university research ... and did not feel an urgent need to increase the level of its aid"; (5) aerospace and electronics companies "expressed alarm about the proposed 25 percent limitation on overhead allowances", which they felt would "effectively put them out of business" as government research contractors. Other companies said "that their government work was such a small proportion of their total research that the limitation would have little overall effect".

IV NATIONAL R&D PROGRAMS

92. "Oceanography Legislation", Hearings before the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Ninetieth Congress, First and Second Sessions, U.S. Government Printing Office, Washington, D.C., 1968, 229 pp.

This volume is a compendium of three separate series of hearings on legislation related to oceanography. In October, 1967, the Subcommittee received testimony from the National Council on Marine Resources and Engineering Development and the Commission on Marine Science, Engineering, and Resources on legislation to extend the time available to both these organizations to complete their work. In April, 1968, the Subcommittee received testimony from interested members of Congress, conservation groups, local interests and Executive Branch witnesses on various bills directed at the establishment of marine sanctuaries. The legislation would authorize the study of the feasibility of establishing such sanctuaries and would limit exploitation (e.g. offshore drilling) of designated areas pending these studies. The Subcommittee took testimony in July, 1968, on a House Concurrent Resolution which express the sense of Congress "that the United States should participate in and give full support to an International Decade of Ocean Exploration during the 1970's". The potentials for the International Decade were discussed by Dr. Edward Wenk, Jr., the Executive Secretary of the National Council on Marine Resources and Engineering Development, and by a State Department representative.

93. "National Marine Sciences Program (Part 1)", Hearings before the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Ninetieth Congress, First Session (August-December, 1967), U.S. Government Printing Office, Washington, D.C., 1968, 509 pp.

These hearings cover comprehensive testimony on the status of the United States marine sciences programs. The subjects covered include: organization of the federal government for dealing with marine activities, past research and future research plans, multiple uses of the coastal zone, food from the sea, international law and relations as they affect ocean resources, military oceanographic programs, the sea grant program, ocean fishing activities and resources, and activities of various government agencies in marine sciences. Testimony was received from many federal agencies including the National Science Foundation, Department of the Interior, Coast Guard, Department of Commerce, Commission on Marine Science, Engineering and Resources, National Aeronautics and Space Administration, Department of Health, Education and

Welfare, Atomic Energy Commission, Agency for International Development, and the Navy Department. Detailed materials were submitted for the record on a variety of related topics.

94. Wenk, E., Jr., "The Oceans - Our Fifty-first State", Remarks before the Inaugural Luncheon of the American Oceanic Organization, Washington, D.C., 14 November 1968, 24 pp.

The author (Executive Secretary, National Council on Marine Resources and Engineering Development) summarizes the progress made during the past two years in developing a national policy for the oceans, and reviews some of the opportunities that lie ahead. Wenk argues that the oceans offer a partial release of the pressure creating several of our most critical national and international problems. Better use of the ocean and its resources might help feed the world's hungry, offer better recreational facilities for the urban populace living on or near the seashore, and supply more minerals and petroleum to accommodate an increasing demand. At present, ocean research does not carry the urgent stimulus originally supporting the space program -- it is not high on the list of our national priorities, and scientific inquiry is in need of powerful advocates in Congress. "But despite stringent economies ... we now estimate for FY 1969 a total of $485 million for marine sciences; up 9 percent from FY 1968, and up 35 percent from FY 1966, during which time Federal R&D as a whole increased only 8 percent". Wenk describes how the Federal government, through the Marine Resources and Engineering Act of 1966, has attempted to coordinate activity in this area and to initiate selected research on several fronts. He describes some of the problems in advancing marine affairs, calls for the active participation of professional societies, and lays out the agenda for marine sciences in 1969.

95. "Sea Grant College Program", Hearing before the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Ninetieth Congress, Second Session (14 March 1968), U.S. Government Printing Office, Washington, D.C., 1968, 37 pp.

This hearing contains National Science Foundation and Department of the Interior testimony in support of additional authorizations for the sea grant program, and for a minor technical change in the authorizing legislation. Although testimony and questions of Subcommittee members concentrated on these aspects, witnesses also provided a general description of the sea grant program's progress through March, 1968, and future plans for the program. The program provides institutional support grants designed to help institutions of higher education develop broadly based major programs for increasing utilization of marine resources. It also provides individual sea grant project support in the marine resource field.

96. MacDonald, G.J.F., "Science and Politics of Rainmaking", Bulletin of the Atomic Scientists, v. 24, no. 8, October 1968, pp. 8-14.

The author, vice-chancellor for research and graduate affairs at the University of California (Santa Barbara), "analyzes the future of weather modification and points out that the scientific basis 'remains uncertain and much basic research remains before operational programs can be embarked on with confidence'". In his view, the federal government should "enunciate national policies concerning weather modification activities within the United States"; "promote research leading to the description, prediction, and development of capabilities in modification of the atmosphere"; "foster the application of weather modification through the establishment of appropriate, legal, regulatory, enforcement, advisory institutions, and measures"; "initiate, support, and encourage programs of education, training, and research in weather modification and provide technical services and facilities related to activities in the pertinent sciences and technology". Activities of the nine federal agencies presently concerned with weather modification are reviewed. The author concludes that the "political, legal, economic, and sociological consequences of deliberate weather modification can be so complex and far-reaching that our present involvement with nuclear affairs will seem simple".

97. Miller, G.P., "The Nation Needs the International Biological Program", Bulletin of the Ecological Society of America, v. 49, no. 4, November 1968, pp. 142-147.

The aims and importance of the International Biological Program (IBP) are discussed by Rep. George P. Miller, Chairman of the House Committee on Science and Astronautics. "The IBP is centrally ecological and as such is indispensable to the development of the intellectual disciplines at stake in pollution abatement and in the appraisal and control of the quality of our environment". Miller cites some of the initial reasons for the slow start of the IBP: the "inherent complexity of ecological interrelations made it difficult to bring the IBP into focus"; original plans encompassed almost the whole of biology; and too many ideas and proposals for research. Now, a "smaller number of integrated multidisciplinary research projects are ... receiving emphasis". The IBP, Miller feels, is the kind of action program needed to develop the skills and knowledge needed for dealing with environmental problems. He notes, in this connection, the scarcity of academic programs in "modern analytical ecology" and the general shortage of trained personnel. Among the arguments for the IBP, Miller cites: the need for ecological knowledge for environmental policy decisions; the experience to be gained in research and systems management; and the attention the IBP will give to "natural biological diversity for productive security", especially in relation to developing countries.

98. Dickson, P.A., "NASA Future Earthbound by Economics", Electronics, v. 41, no. 21, 14 October 1968, pp. 169-173.

"As it begins its second decade, the National Aeronautics and Space Administration doesn't know where it's headed". Future NASA programs are explored in the article through quotations from various NASA officials and NASA contractors. No consensus was evident -- but most agreed that there would be no single objective to replace the current on-the-moon-by-1970 approach. Probable follow-on programs include: unmanned exploration of planets like Mercury and Jupiter; establishment of an orbital space station and greater efforts to apply technology developed in past NASA research. Budget problems are likely to continue into the 1970's, thereby limiting the number of projects which can be funded. NASA's aeronautical research may well expand with renewed interest in V/STOL technology, air foil design, work on supersonic aircraft and noise control research. Some commenters believe that the current plateau in funding will be followed by a re-emphasis on NASA programs but "this contention ... presupposes that the agency's plant and capacities are not permitted to deteriorate below a given reactivation level".

99. "Aerospace Industry Keeps Its Cool", Electronics, v. 41, no. 2, 14 October 1968, pp. 175-180.

Major aerospace contractors will continue to work on space-oriented programs despite NASA's funding problems. Teams of engineers and scientists will be supported by in-house funds in anticipation of future space-technology demands. Industry-supported research will concentrate on earth and near-earth applications such as meteorological, communications, and resource-surveying satellites. Also being considered is an orbital space station, which could serve as a computer laboratory. Company officials also expect to do some research in the unmanned-mission area, though NASA is currently committed to manned-space-flight missions. NASA's cutbacks have some corporations concerned about a consumer for the advanced technologies being contemplated. Despite lowered morale of scientists and engineers, management officials seem to feel that space programs have been extended rather than dropped; they expect fluctuations in space efforts to result from changes in the economic and social scene.

100. Green, H.P., "'Reasonable Assurance' of 'No Undue Risk'", Scientist and Citizen, v. 10, no. 5, June/July 1968, pp. 128-140.

"At a time when there is an ever-increasing number of nuclear reactors being constructed and proposed, the public assumes the risks presented by the radioactivity which may be released in normal operations and in possible accidents. The conflict of interest between development of nuclear power on the one hand and public safety on the other is the domain of the Atomic

Energy Commission and its licensing procedures. The author of this article examines carefully the AEC's licensing and regulatory program and concludes that the procedures are weighted in favor of accelerated nuclear power development. He urges that questions of reactor safety be resolved openly with all the issues made understandable to the public". "This approach would undoubtedly slow the steam roller of technological progress. It would undoubtedly make licensing procedures more difficult and expensive for industry, and might even deter decisions to 'go nuclear'. But why the hurry?"

101. "Reorganization", Science, v. 162, no. 3855, 15 November 1968, p. 778.

"The Department of the Interior has consolidated its water research programs, including its Office of Water Research. Assistant Secretary Max N. Edwards will evaluate proposed programs, establish priorities, and coordinate Interior's $83-million-per-year water resources research effort. Similarly, Interior will bring its marine resources programs under a single authority and establish an Office of Marine Resources (OMR) under Assistant Secretary Clarence Pautzke. OMR is expected to coordinate marine pollution control, estuarine studies, multi-use of the coastal zone and high seas, and other programs".

V SCIENCE, EDUCATION, AND THE UNIVERSITY

77. Daddario, E. Q., "Academic Science and the Federal Government", Science, v. 162, no. 3859, December 13, 1968, pp. 1249-1252.

Certain paradoxes "must be resolved before academic science can join with the federal governments in a creative partnership". "The first paradox is this: science... is affected by funding, funding is dependent on public policy, so science must affect public policy. The second paradox is that science is... aloof from politicking", but "it is in the best interests of science to get involved in both politics and public opinion". "The essence of the second paradox lies in the requirement for the opposing concepts of constraint versus flexibility, of detailed planning versus serendipity". These concepts must be balanced in order to encompass "the 'scientific estate' and 'predictive' politics in the government-science relationship". "The third paradox... is the need for balance between the acquisition of new knowledge through basic research and better application of current knowledge". The "best way to resolve the paradoxes... is to formulate a new structure", an organization that would "provide strategies for eliminating the causes of complex crises problems we are now facing". Toward this end, Daddario outlines "the necessary characteristics of the new organization", and cites some "suggestions along these lines that are currently being supported by various factions of both science and government".

78. "Establishment of Science and Public Policy Studies Group", Announcement from Massachusetts Institute of Technology, November 15, 1968, 2 pp.

A Science and Public Policy Studies Group was formally established as of November, 1968, with Professor Eugene B. Skolnikoff of the M.I.T. Political Science Department acting as chairman. The group is "designed to serve as a focus of interest and information for the growing community of scholars, universities and government officials engaged in the development of teaching and research in science and public policy". The Studies Group will perform functions such as organizing special symposia of interest to those in the field, acting as a clearinghouse for information, facilitating exchange of experience and ideas for academic courses, developing priorities for research in science and public policy. Any university with "an active teaching and research program in science and public policy, or exploring such a program is welcome to become affiliated". Contributions from a number of universities and a matching grant from Alfred P. Sloan Foundations will provide funding for a two-year period. Some 50 universities have

already indicated a desire to be associated with the Studies Group.

(For further information or questions, address correspondence to: Mrs. Ardith Betts, Executive Secretary, Science and Public Policy Studies Group, E53-418, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139).

79. "Miller Bill Gets Competition", Science Research, v. 3, no. 25, 9 December 1968, p. 21.

"The ACE [American Council on Education] bill, which would provide institutional grants for higher education at the two-year and four-year college levels and possibly through the PhD level, will be the third major aid-for-higher-education bill before the 91st Congress next year". "The first is the Miller bill, sponsored by George P. Miller, chairman of the House Science & Astronautics Committee, which calls for institutional grants for science education only. Another bill, to be re-introduced by Rep. Donald M. Fraser of Minnesota, provides institutional grants in all fields of study, but at the PhD level only". John F. Morse, director of ACE's commission on federal relations, believes that both the Miller and Fraser bills' "scope is too narrow". "However, in the light of a new Republican Administration and the economy-mindedness of Congress, it does not seem likely that more than one, if any, of these bills will be passed. Morse feels that the new Congress will be more sympathetic to aid for higher education in general than to aid for science education alone".

80. "Institutional Grants Bill", Hearings before the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, No. 9, U.S. Government Printing Office, Washington, D.C., 1968, 388 pp.

The aim of this bill, which is often referred to as the "Miller bill", is to "promote the advancement of science and the education of scientists through a national program of institutional grants to ... colleges and universities". The bill, introduced by Rep. George Miller "at the request of a number of educational associations, groups, and individuals", would provide $150 million annually to U.S. institutions of higher education. The program would be administered by the National Science Foundation and the funds would be distributed in accordance with a complex formula. One-third of the funds would go to institutions "as a graduated percentage of the total sum of project awards received by them during the ... preceding year from the National Science Foundation, the National Institutes of Health, and the ... Office of Education". One-third would be divided among states in proportion to their number of high-school graduates,

and the remaining third would go to institutions on the basis of the total number of advanced degrees awarded. The testimony of some 20 witnesses is presented, along with various supporting documents.

81. "Scientific Activities at Universities and Colleges 1964", Surveys of Science Resources Series, National Science Foundation, NSF 68-22, May 1968, 96 pp.

This report provides additional analysis of the results of the National Science Foundation's (NSF) Survey of Scientific Activities of Universities and Colleges in 1964. The survey was initially summarized "in the NSF Reviews of Data on Science Resources, No. 9, in August 1966"; that survey provided general-purpose data on the financial and manpower resources used for research, development, and instruction in the sciences and engineering". This report presents more detailed analyses and data in such areas as: expenditures for scientific activities in universities and colleges for research and development, for instruction and departmental research, and for scientific and engineering facilities and equipment; employment characteristics of scientists and engineers and technicians in institutions granting graduate degrees; total expenditures for medical schools and state agricultural schools and experimental stations; expenditures for federally funded research and development centers administered by universities and university consortia.

(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 2040 -- Price $1.00).

82. "The Draft: Graduate Schools and Students Are Still Worried", Science, v. 162, no. 3854, pp. 653-655.

"The sharp drop in graduate school enrollments feared by educators early this year did not materialize in many universities when classes opened in September. A decline had been anticipated because of the new Selective Service provisions under which students who started graduate degree programs after 1 July 1967 are no longer eligible for 2-S (student deferments". "One reason why more graduate students haven't yet been taken is that draft calls have been relatively low in recent months; many of the monthly calls have averaged about 12,000 men". "Other reasons...include the slowness of local draft boards in reclassifying students and the fact that many of those who have been reclassified have appealed, thereby slowing down the induction process". "Principle explanations for the failure of graduate student enrollments to decline as had been anticipated include: (1) some graduate schools admitted more students than usual; (2) many students enrolled in graduate school this autumn despite the knowledge that they are now eligible for the draft". "One thing is certain: graduate

schools and many graduate students are finding it difficult to deal with the uncertainty of the future".

83. "Fulbright Cuts Deepen", Science, v. 162, no. 3854, 8 November 1968, p. 654.

"Cutbacks in the number of American students participating in the Fulbright program will be even greater than anticipated earlier... The Institute of Internation Education (IIE), which administers the Fulbright program for the government, says that postdoctoral research and the creative and performing arts will be hardest hit. There will be no Fulbright grants to the United Kingdom for Americans. All American student grants to Japan, Malaysia, and the Philippines have been eliminated; all teaching assistantships to India and Japan have also been withdrawn. There has been no change, however, in the number of U.S. travel grants to Eastern European countries. Final plans for Western European countries are still unclear".

84. "Consortium Seeks Money From NSF for a National Ecology Institute", Scientific Research, v. 3, no. 23, 11 November 1968, p. 20.

"Ten U.S. universities and the Smithsonian Institution, acting as a consortium, will propose ... the creation of a National Institute of Ecology patterned after the National Center for Atmospheric Research at Boulder, Colorado. The group will ask the National Science Foundation for about $100,000 to finance a feasibility study to work out a detailed plan". Le Mont C. Cole of Cornell University, and head of the ecology study committee of the Ecological Society of America, believes "his consortium has a very good chance of getting money in fiscal 1970 from the Foundation despite its prevalent budget stringency". "However, an NSF official said the Foundation has made no precommitment, and he hinted that even $100,000 would be hard to find next year". Functions of the institute could include: "research in almost any area of ecology, ... including air and water pollution and the use of herbicides anywhere in the world, and it could additionally coordinate ecological research on a worldwide scale"; "establishment of a computerized ecological data center"; "systems analysis of entire ecosystems". The feasibility study will attempt to answer such questions as, "How many scientists would work at the institute, how much equipment would be needed and how much money would be needed to establish it and keep it running". Current university members of the consortium are Yale, Cornell, Georgia, Michigan, Michigan State, Chicago, Wisconsin, California, Texas, and Duke.

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

115. "Next Chance for American Science Policy", Nature, v. 220, no. 5172, 14 December 1968, pp. 1059-1060.

Dr. Lee DuBridge, as President Nixon's Science Adviser, faces science-policy problems in immediate need of solution: (1) The most obvious need is that the new Administration should make a settlement on the strategy for the exploration of space which will last well into the seventies, not merely satisfy the needs of NASA for the fiscal year immediately ahead"; (2) " ... a policy for scientific research in the universities is urgently necessary .... What Congress overlooks, of course, is that scientific research is a necessary part of the research structure in the United States, and that it is folly to look for a continued growth of higher education without being prepared to pay a steadily rising bill for research"; (3) "The most immediate practical need ... is a substantial strengthening of the National Science Foundation .... The principle to be established is that the NSF should become the foundation for academic scientific research and not just the means by which the oversights of the big spending agencies can be made good"; (4) " ... the Federal Government should pay closer attention than in the past to the environmental problems occasioned by science and technology -- pollution and the like". Trouble spots in the formation of policies are pinpointed, and key principles are suggested. No specific policy recommendations are suggested.

116. "NSF Will Enter '70s With A New Look", Scientific Research, v. 3, no. 25, 9 December 1968, pp. 13-14.

The National Science Board has announced plans for two simultaneous studies of the National Science Foundation (NSF): (1) a long-range study of NSF's role and (2) a short-range evaluation of NSF's organization and management practices. The long-range study will be conducted by an 8-member planning committee headed by Emanuel Piore, IBM vice-president and chief scientist. The committee is charged with considering the scientific areas and interdisciplinary programs that NSF should support in the future; the role of NSF in science education; and means for implementing "the new mandate given by the Daddario bill in applied science and social sciences". "One of the thorniest and most persistent questions the committee will have to cope with is the Foundation's troubled relations with Congress". Another topic to be considered by the committee is the establishment of a department of science (or science and education), with NSF at its core. The second study will focus "on

how the Foundation can best carry out its present programs as well as the additional ones called for in the Daddario NSF re-organization bill". This study, which will be conducted by a task force and an advisory committee, will be directed by John V. Vinciguerra of the Atomic Energy Commission. The first study does not have a completion deadline and is expected to require several months; the second study is expected to be completed by mid-March 1969.

117. "No Relief in Sight for R&D Fund Cuts", Chemical & Engineering News, v.46, no. 50, 25 November 1968, pp. 9-10.

The 1969 activities schedule is outlined for the House Subcommittee on Science, Research and Development, headed by Rep. Daddario. With one exception, the subcommittee plans to tackle the same major problems it worked over this year. The exception is the authorization of the National Science Foundation's programs for fiscal 1970 so that money can be appropriated to carry out the programs. Other principal efforts include: "finding a suitable formula ... for funneling federal support for science and science education" (hearings on H.R. 875, the Miller Bill, will be continued until modified fund distribution formulas are decided); developing a mechanism for technological assessment (three reports are expected from the National Academy of Sciences, the National Academy of Engineering and the Library of Congress, respectively, covering the methodology of the present assessment procedure; a number of pilot assessment projects and what happened to them; and a review on a case-history basis of a number of instances in which Congress has had to deal with social-technological-political situations since World War II). On the basis of these reports, the subcommittee will draft a new bill to replace the original proposal for a Technology Assessment Board. Other topics on the agenda are: more effective utilization of federal laboratories, the application of science to urban problems, and the study of environmental quality.

118. "Technology Assessment Symposium", The George Washington Law Review, v. 36, no. 5, July 1968, The George Washington University, Washington, D.C., 163 pp.

The bulk of this issue of the Review is devoted to the presentation of a series of papers on "technology assessment", which is concerned, broadly, with "identifying, assessing, publicizing, and dealing with the implications and effects of applied research and technology". The six papers on this topic are:

- "Technology Assessment and the Law: Introduction and Perspective" (Harold P. Green)
- "Technology Assessment -- A Legislative View" (Hon. Emilio Q. Daddario)
- "The Role of Planning in the Atomic Energy Program" (Hon. James T. Ramey)
- "Technological Change, Technological Forecasting and Planning R&D -- A View from the R&D Manager's Desk" (Marvin J. Cetron

and Alan L. Weiser)
- "Controlling the Potential Hazards of Government -- Sponsored Technology" (Michael Wollan)
- "The Role of Congress in Promoting and Controlling Technological Advance" (Hon. Edmund S. Muskie)

119. "Utilization of Federal Laboratories", Report of the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, U.S. Government Printing Office, Washington, D.C., 1968, 68 pp.

This report presents the subcommittee's conclusions and recommendations for the future use of federal laboratories, based upon hearings held in April and May of 1968. The general thrust of the report is that federal laboratories, reflecting expenditures of $3.5 billion in fiscal 1969, could be more effectively utilized. The report notes that no "longer can we afford an automatic response of 'Let's build another laboratory' when a new agency is created, or an existing agency starts a new program". Instead, the subcommittee calls for greater interagency use of laboratories, new policies for their management and utilization, and the application of their R&D capability to law enforcement and crime control. Toward these ends, the subcommittee recommends adoption of a positive policy for utilization of the laboratories, increased discretionary funds for laboratory directors, a greater role for the laboratory directors in policy formulation and exemption of laboratories from agency personnel ceilings. To support these recommendations, the report reviews past federal policy on the laboratories, past reports on the subject and current organization of the federal government to deal with laboratory problems. The report also summarizes much of the testimony given at the subcommittee's hearings.

120. "Utilization of Federal Laboratories", Hearings before the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session (March-April 1968), No. 6, U.S. Government Printing Office, Washington, D.C., 1968, 457 pp.

These hearings represent a comprehensive attempt by the Subcommittee to review the status of federal laboratories, with particular emphasis on the use of such laboratories by government agencies other than the one which originally sponsored the laboratory. Testimony was taken from laboratory directors (Oak Ridge, National Bureau of Standards, Navy Undersea Warfare Center, and Jet Propulsion Laboratory), from agencies sponsoring laboratories (NASA, Defense, Health Education and Welfare, AEC) and from agencies with expanding R&D needs in transportation, housing and urban development and law enforcement. Representatives of the Office of Science and Technology and the Bureau of The Budget provided testimony dealing with overall federal

policy vis-à-vis the laboratories. In addition to the testimony, which provides valuable insight into the current uses and plans of the federal laboratories, a variety of key documents are printed as appendices to the hearings. These include the "Bell Report" on government contracting for research and development, several executive orders and Budget Bureau Circulars relating to federal laboratories, the "Killian Committee" report on utilization of scientific and engineering manpower and citations to other Congressional documents dealing with federal laboratories.

121. Bradley, B.D., "Program Budgeting", A Paper Prepared for Presentation at the 49th International Conference of the Administrative Management Society, Held in Los Angeles, California, The Rand Corporation, Santa Monica, California, May 1968, 9 pp.

There is a "compelling need for better techniques of budgetary decisionmaking -- better means for efficiently allocating the scarce resources of government among competing objectives and service demands. One such technique, program budgeting, is now being widely introduced at all levels of government". The major features of program budgeting -- its structural and analytical aspects -- and some of its current applications are discussed in this paper. The author concludes that: "To date, none of the major attempts at implementing program budgeting in government have been fully completed". "Bureaucratic inertia, training people to do useful analyses and just plain administrative complexity are continuing and difficult problems". "Both in theory and in practice, program budgeting is far from mature". But, even in its present incomplete state, it "offers significant potential for greater efficiency and economy in the allocation of resources".

122. Greene, W.A., "Step Funded Research Grants", BioScience, v. 18, no. 12, December 1968, pp. 1133-1136.

The step funding concept is described and illustrated, and its advantages and disadvantages for the investigator and sponsoring agency are discussed. "Step funding is derived from a combination of the best parts of ... short-term, long-term, and conditional long-term support. With step funding, the sponsoring agency provides funds for 3 years, but the money is spread in tapering amounts over the period; viz., the first year is fully supported, while 2/3 and 1/3 of the eventually required amounts are provided for the second and third years, respectively. Each year the project is reviewed and, if it is to be continued, additional funds are added to raise the level of effort and to extend the work for an additional year. The original tapering funding structure in the last 2 years is maintained". The cited advantages of step funding include: "it guarantees the investigator time and funds to carry out plans made 3 years in advance";

"a smooth, nontraumatic tapering off period of at least 2 years is available"; and the full cost of the grant is not "charged against the agency's funds for any single fiscal year".

123. "NSF Antiriot Provision", Science, v. 162, no. 3855, 15 November 1968, p. 778.

"More than 18,000 graduate and undergraduate students now receiving National Science Foundation (NSF) support could be affected by an antiriot amendment, attached by Congress to the NSF appropriations bill. Like the recently passed Higher Education Act antiriot provision, the NSF version requires the university to give the student the opportunity for a hearing if the institution decides to withhold federal aid, but it differs from the earlier provision in that it does not require the university to cut funds for a student convicted of a felony as a result of a campus demonstration. The amendment affects about 500 NSF undergraduate basic research project grantees, 3700 undergraduate research participants, 2300 graduate fellows, 5600 graduate trainees, 1000 graduate summer trainees, and 5100 basic research project graduate assistants."

124. "Civil Aviation Research and Development. An Assessment of Federal Government Involvement", Summary Report, Aeronautics and Space Engineering Board, National Academy of Engineering, Washington, D.C., August 1968, 76 pp.

The Aeronautics and Space Engineering Board, which was established in May 1967 by the National Academy of Engineering to advise NASA and other government agencies, issued the results of its first study, "An Assessment of Federal Government Involvement in Civil Aviation Research and Development". "After considering the multiplicity of factors affecting the growth of civil aviation, the Board concluded that the three most critical factors are (1) airport and support facilities, (2) noise, and (3) air traffic control". "The most important recommendation of the Board pertains to knitting together more tightly the civil aviation research and development activities of the Department of Transportation, ... the Federal Aviation Administration and the National Aeronautics and Space Administration, and especially to dividing their responsibilities according to capability. The DOT should provide the leadership in conducting systems studies to identify, analyze, and rank civil aviation goals as well as the research and development needed to attain these goals; NASA should be responsible for research and development in all the areas of importance to civil aeronautics; the FAA should, in addition to operating the airways network, be responsible for the systems testing of the resulting operational concepts and hardware". "A recommended first step beyond this study is to examine the priorities to be assigned to each research and development objective in terms of its relative contribution to the effectiveness of the civil air transportation system".

125. "Aeronautic Research Roles to Be Studied", Aviation Week & Space Technology, v. 89, no. 15, 7 October 1968, pp. 115-116.

The appropriate role of government in "basic aeronautical research and development will be studied by the National Aeronautics and Space Administration and the Transportation Dept." The study, to be led by the Transportation Department and to involve other agencies, will also assess the "potential benefits of improved aviation systems" and "measure and relate the development and growth of aviation to the national welfare and economy". One major question is which federal agency should assume the lead in whatever R&D programs are to be undertaken in the future. These plans and issues were recently discussed in connection with congressional hearings into the future needs of aeronautics in the U.S. In these hearings, Thomas Paine of NASA said that the future of aeronautical R&D is 'extremely threatened' by "budgetary limitations despite the decision by NASA to apply more funds to the area in recent years". NASA is expected to fight for an active role in future R&D.

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

122. Fox, W.T., "Science, Technology and International Politics", International Studies Quarterly, v. 21, no. 1, March 1968, pp. 1-15.

"As the superpowers of the 1960's have been discovering that they can neither make war on nor make peace with each other, the arms race between them has been giving way to a space race, itself part of a larger science and technology race". This article discusses the impact of science and technology upon the international political scene. The post war experience, Fox states, has been greatly affected by the power positions in nuclear weapons proficiency and, on another level, success in the space race. He suggests "that Soviet-American competition in the science race is having a benign effect on world politics ... the science race tends to keep the arms race qualitative, thus keeping each side from feeling that it is sufficiently prepared to resort to trial by battle". "Thus, the science race may have promoted the 'deceleration of history'. All over the world there are problems too important to ignore, but not important enough to cause Washington and Moscow to choose to destroy each other. So history slows down, the problems remain, and some of them grow daily more menacing". On the other hand, Fox suggests that this competition must look to the needs created by our national deficiencies and to the requirements of less advantaged people. "For the world as a whole the minimum requirement is set by the competition of national systems not with each other but with nature itself".

123. Pardo, A., "Who Will Control the Seabed?", Foreign Affairs, v. 47, no. 1, October 1968, pp. 123-137.

There "has been an increasing realization of the importance of ocean resources to man's future ... rapid technological progress has resulted in the discovery of vast mineral resources on and under the ocean floor and has made these resources accessible and exploitable for a variety of purposes". Both private exploitation and military uses of the seabed will become more important. These developments call into question the current legal arrangements (or lack of them) for dealing with the seabed. "It is clear that vigorous action by the international community is becoming imperative in the interests of all". Three alternative approaches are available: (1) a continued policy of "wait-and-see" marked by ever expanding national claims and increased potentials for controversy, (2) a "national lake" solution, parceling the seabed among individual nations, or (3) an international regime, encouraging an orderly, peaceful and economically efficient exploitation. The author suggests that the third alternative is the only reasonable one, and lauds current activities under UN auspices to deal with control of the seabed.

124. Borgese, E.M., "The Ocean Regime", A Center Occasional Paper, Center for the Study of Democratic Institutions, Santa Barbara, California 43103, October 1968, 40 pp. ($1.00)

This document presents and discusses "A Suggested Statute for the Peaceful Uses of the High Seas and the Sea-Bed Beyond the Limits of National Jurisdiction". It first describes and assesses previously proposed treaties (Senator Clairborne Pell's and Aaron Danzig's for the United Nations), and then reviews the events and the Center's activities in this area that led up to the present document. The draft statute is presented in the form of 21 articles for the establishment and operation of an "International Regime". A following section discusses each article and presents some 50 references to the topic. The author proposes that the draft statute be used as the basis for an international conference in 1970 to establish a "Marine Planning Agency" which would "proceed to structure the Ocean Decade, while the U.N. Ad Hoc Committee" would proceed "with its essential job of drafting the Treaty establishing the regime". This proposal "is an unorthodox procedure, but it may be just what is needed when all orthodoxies seem headed for dead-ends".

125. Wolman, A., "Pollution as an International Issue", Foreign Affairs, v. 47, no. 1, October 1968, pp. 164-175.

It is "inevitable that the movement of wastes by water, air and land will often cross national and international barriers" and these "consequences have become more evident in the last half century". The author calls for the establishment of "some international agency ... charged with the responsibility of the continuing examination, identification and assessment of changes in the total resources picture. Essentially, we need an intelligence agency in matters of human ecology". Several illustrations of problems needing such attention are presented. Some attempts have been made to deal with these international pollution problems, primarily in the field of international rivers, but also in oil pollution and to a limited degree radioactive pollution sources and air pollution. "With few exceptions most of the existing international agreements have not had rapid success in correcting or preventing pollution". Improvements in this situation depend in part upon the development of an international intelligence and monitoring network and greater knowledge of the pollution phenomena. "The spread of pollution transcends national ownership. Agreements on control will have to come -- and it is not too early to develop and begin to implement them".

126. "Gaps in Technology. General Report", Organization for Economic Co-operation and Development, no. 24685, October 1968, 41 pp.

This report summarizes the findings of the OECD Committee for Science Policy on the nature, causes, and remedies for "technology gaps". The report, which is based on a series of studies of different industries (scientific instruments, electronic components, computers, plastics, pharmaceuticals, non-ferrous metals), was prepared for use at the "Third Ministerial Meeting on Science of OECD Countries" in March 1968. The nature and extent of technological gaps is described in terms of differences between countries in scientific and technological capabilities, technological innovation, and the international exchange of goods, capital and technology. The relation of science to social and economic change is discussed, as is the role of innovation and its diffusion in economic growth, and the contribution of research-intensive industries to the diffusion of new products and processes. The "political importance of the issues" generated by technological gaps come from "the growing importance of science-intensive industries, the increasing 'price of entry' to the market, and the growing role of direct investment and international companies in the process of technological transfer". Action is required to enable "industries to strengthen their performance in original innovation, and their abilities to exploit these innovations in the market", "to develop more effective forms of cooperation ... to overcome the existing fragmentation of markets, industries and technological efforts" and to "avoid the development of obstacles to technological exchanges". Possible policies to achieve these ends are discussed.

(Copies of the report may be obtained from: OECD Publications Center, Suite 1305, 1750 Pennsylvania Avenue, N.W., Washington, D.C. 20006 -- Price $1.20)

127. Suranyi-Unger, T., Jr., "What Is the Technology Gap", Interplay, v. 2, no. 1, June/July 1968, pp. 22-25.

The author attempts to organize, clarify and interpret the multitude of "much repeated, but often confusing and conflicting views" of the so-called "technology gap". He begins with a brief historical background of the initial concept, and concludes "that much of the confusion surrounding the technology gap arises from equivocal understanding of the meaning of technology". He then classifies and discusses the views and interpretations of the technology gap into six categories: "(1) The general economic and sociological structures and dimensions between the two continents - a general social-economic gap; (2) The practices and procedures of business management - a management gap; (3) The efficacy of the educational systems, especially in technical and engineering education - an education gap; (4) The research and development efforts - an R&D gap; 5) The level of U.S. business activity in Europe and European business activity in the U.S. - a foreign

investment gap, and (6) The migration of scientific talent from Europe to the U.S. and from the U.S. to Europe - a talent movement gap, better known as the 'brain drain'". He concludes with several observations of the degrees of concern typically elicited from the Western European countries.

128. Kannappan, S., "The Brain Drain and Developing Countries", International Labor Review, v. 98, no. 1, July 1968, pp. 1-26.

A comprehensive discussion of the brain drain is presented with evaluation and analysis of available data. "Our investigation of the brain drain does not support the viewpoint that the net balance of transactions in human skills is unfavorable to the developing countries. Even when we take the more limited area covered by the foreign student programmer, including the losses suffered by the poor countries due to the brain drain, it seems certain that the stock of skills of the poor countries has increased as a result. It is also unlikely that the costs incurred by the poor countries in the development of human resources lost to overseas employment or sent abroad for training exceed the benefits in the form of donor country expenditures on training students who return to the poor countries. It may still be argued ... that a poor country suffers a welfare loss every time a trained national is lost to overseas employment. It has been shown that this is theoretically possible under certain conditions but that the losses perhaps tend to be exaggerated and the benefits underestimated. One reason for this is the considerable difference in the skill requirements of poor countries as compared to the skills, actual or potential, that may be developed by the national educational system or by overseas study".

129. Sutherland, G., "The Migration of Scientists", The Advancement of Science, v. 25, no. 123, September 1968, pp. 84-91.

The "brain drain" problem is reviewed, especially as it applies to the U.K., the "basic causes" of the drain are discussed, and some countermeasures are presented and assessed. Between 1961-1966, the annual net loss of U.K. scientists increased from 400 to 800; in the same period "we went from a net annual gain of 400 engineers and technologists to a net annual loss of nearly 200". The latter figure represents about 20 percent of our annual output of such men and if the trend ... is not reversed, it could mean that by 1970 we might be losing about 50 percent of our output". The author contends that the "major cause of the world-wide phenomenon is ... the failure of the U.S. government to realize that" their R&D objectives "could not be accomplished without drawing on the scientific and technical manpower of other countries". Several proposed countermeasures to the brain drain are reviewed and judged to be ineffective, at least in the short-term future. The best solution, according

to Sutherland, is "restrictions on the import side", with the U.S. taking the first step in this direction.

130. Knoppers, A. T., "Transferring Technology: A New Situation", Interplay, v. 2, no. 4, November 1968, pp. 26-29.

Starting from certain points that "we can accept ... as ... axiomatic", the author explores various facets of "technology transfer" as they relate to the U.S., other developed nations, and underdeveloped countries. The axioms are: (1) "that a perceptible 'gap' in America's favor exists between the United States and Europe in certain major areas of technology"; (2) "that corporations with leadership in advanced technology are well positioned to increase their lead ... because they possess superior resources and organization as well as the experience necessary for the next technological step forward"; (3) "that 'marketable technology results from a managed process, with decisive and understanding management the key"; (4) "that the traditions and values of a society itself ... act to advance or retard the highly intricate process of technological development". Postulating these points, the author asks and attempts to answer the following questions: "What are their implications (a) for the U.S. (where the economic infusion of technology is needed critically in some areas) in a moment of considerable political and social tension?"; (b) "in terms of short- and long-term relationships between the U.S. and West Europe?"; (c) "for the relationship of the United States and Europe vis-à-vis the emerging nations?". These are the difficult and dangerous questions that defy dogmatic answers". In conclusion, the author proposes a "purely technological demonstration conference, conducted on a world basis ... as a "non-political forum for the presentation of the technique for solution of major problems of industrialization". Such a conference "could conceivably whet the interest of the less-developed nations in self-improvement, and it might create a degree of enthusiasm to help among the richer nations".

131. Hall, G.R. and Johnson, R.E., "Transfers of United States Aerospace Technology to Japan", The RAND Corporation, Santa Monica, California, July 1968, 95 pp.

The process and costs of transferring manufacturing technology from U.S. to Japanese aircraft producers is described in this study. The case study examines "the circumstances that led to Japanese production of four U.S.-designed aircraft during the 1950's and 1960's, the flows of requisite technology and other goods and services, and the costs of transferring the technology. The history of this experience is instructive about the process and costs of one country's acquiring a sophisticated technical capability from another". The results show that the direct costs (e.g. royalties, technical assistance payments) of transfer were

only a small fraction of the total program costs. "Nor were the indirect cost effects as large as might be expected". "This co-production experience has important policy ... implications" with regard to military and economic assistance programs. "Japan acquired the economic benefits of production experience without additional costs" and it "enabled Japan to develop a small but advanced industry". Co-production, unlike grant-aid, has the recipient country share the financial burden, and unlike direct military sales, "it has much greater economic and political acceptability because the weapons are locally produced". Further, "purchases from U.S. firms by Japanese contractors, subcontractors, and vendors resulted in very considerable U.S. sales and attendant balance-of-trade benefits".

132. "State Dept. Forming Advisory Group for Science, Technology", Scientific Research, v. 3, no. 22, 28 October 1968, p. 27.

"The first two of a proposed group of scientific advisers have been appointed by the State Dept. Gordon J.F. MacDonald of the Institute for Defense Analyses and Thomas F. Malone, director of Travelers Research Center, are the charter members of a general advisory committee to the Secretary of State and to Herman Pollack, State's director of international technological and scientific affairs. Pollack's people say the decision to appoint part-time advisers was not motivated by the Department's failure to find a top scientist for Pollacks' job. Either way, they explain, they saw a need for expanding, diversifying and institutionalizing their lines of communication with the scientific community".

133. "NAS to Give Grants to Aid Foreign Geophysics Research", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. 18, no. 10, December 1968, pp. 4-5.

"The National Academy of Sciences has established a program of grants to aid the work of foreign collaborators of American geophysicists". The program, which is to be known as the Arthur L. Day Projects in Foreign Cooperative Geophysics, will provide support for work in geophysics, as well as in "such associated disciplines as geochemistry, meteorology, solar-terrestrial studies, and many aspects of geology, oceanography, and hydrology". The creation of the program recognizes the ... often drastic limitations on funding available to foreign investigators who work closely with United States scientists on cooperative geophysical studies". "Under the new grants program, U.S. scientists who are directly involved in programs of geophysical studies in foreign or undeveloped regions may now apply to the Academy for modest grants to support expenditures for the studies by their local collaborators in those regions. The expenditures will be under the general guidance and control of the U.S. investigator. He is required only to certify that the money was expended in

furthering the specified studies of the physics of the earth and to present a brief report outlining the results obtained".

134. "Exchange Programs With USSR, Poland Reduced for 1968-69", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. 18, no. 10, December 1968, p. 5.

"The National Academy of Sciences' exchange programs with the academies of sciences of the USSR and Poland are being reduced in the present academic year, and anticipated new programs with the academies of Bulgaria and Hungary cannot be commenced as a result of sharply decreased financial support from the National Science Foundation. Programs with the Yugoslav, Czechoslovak, and Romanian academies will continue at agreed levels". "The practical results are a reduction in the program with the Soviet Academy from about 90 to 52 man-months of visits in the current academic year; the Polish program is reduced from 40 to 27 man-months. Should additional funds become available to support the exchange programs, the lost volume of visits would be reinstated to the extent possible".

135. "AAAS Board Reviews Defoliation Data", Science, v. 162, no. 3852, 25 October 1968, p. 437.

"The AAAS board at its meeting last weekend made no public comment on the progress of its dialogue with the Department of Defense (DOD) on the use of herbicides in Vietnam". Earlier, "the board had expressed concern about the use of arsenicals in defoliation operations in Vietnam and urged that 'steps be promptly undertaken to initiate detailed, long-term, on-the-spot studies of the regions of Vietnam affected by the use of herbicides'. It has been reported that John S. Foster, Jr., Director of Defense Research and Engineering, replied to the AAAS board, in terms which essentially repeated an earlier DOD statement, that DOD judged, on the basis of information gathered in Vietnam, that no serious long-term ecological effects will occur as the result of the defoliation program, and that the military benefits of the program are substantial". "The fullest recent official comment on the defoliation program came in a report of a survey of allied herbicide operations which was released in September by the U.S. Mission in Saigon. An interagency committee which studied military, economic, and ecological aspects of the defoliation program reported that herbicide spraying had apparently not caused significant ecological damage and that, while the program had caused substantial economic losses due principally to timber damage, the interagency group had concluded that military benefits outweigh the 'unknowns' of the military program".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

226. "WFSW Conference on European Scientific Co-operation", Scientific World, v. 12, no. 4-5, 1968, pp. 3-51.

This "double issue" of Scientific World is devoted entirely to a representative selection of the papers presented to the conference organized by the World Federation of Scientific Workers in Vienna in April 1968. The conference, convened under the title "The Conditions and Possibilities of Scientific Co-operation in Europe", "surveyed existing examples of international European scientific cooperation, discussed their successes and shortcomings, and attempted to identify the factors essential for successful co-operation in scientific and technological projects". Among the papers presented in this issue are the following:

- Conditions for European Scientific Cooperation: Considerations from CERN Experience (M.G.N. Hine, Switzerland)
- Some Questions Related to European Scientific Co-operation (G.G. Kotovsky, U.S.S.R.)
- EMBO -- The European Molecular Biology Organization (M.R. Pollock, U.K.)
- Stimulatory and Inhibitory Factors of the Establishment of International Scientific Research Institutions (F.B. Straub, Hungary)
- International Scientific Co-operation and the Limitation of Armaments (J. Kuczynski, G.D.R.)
- European Security -- A Condition for the Development of Scientific Cooperation (V.B. Ushakov, U.S.S.R.)

In addition to these papers, a summary report of the two conference sessions, "Scientific Co-operation in Europe" and "Conditions of Scientific Co-operation in Europe", is presented.

227. "European Cooperation", Industrial Research, v. 10, no. 11, November 1968, p. 33.

"Detailed proposals for a European Technological Center, announced recently in Denmark by Britain's Minister of Technology, Anthony Wedgwood Benn, indicate the increasing importance attached to the need for European collaboration. Britain's minister hopes that effective European technological and industrial cooperation as of now would lead inexorably to an enlarged European Economic Community including Britain; but the powerful Confereration of British Industry, which has no political axe to grind, also is rooting for dynamic action."

... John Davies, director-general of CBI, ... "made a strong plea for closer technological cooperation between European countries on the grounds that if Europe is to compete effectively today in the technological race -- specifically with the U.S. -- it must be on the basis of a concerted effort. The purpose of the European Technological Center, Benn explained, would be to initiate studies of particular sectors of industry in Europe, assess the long-term market in Europe for an industry's products, and make proposals for structural changes in the industry concerned."

228. Edelson, E., "Gloom in the Space Lobbies", New Scientist, v. 40, no. 620, October 24, 1968, pp. 179-180.

"The nineteenth Congress of the International Astronautical Federation (IAF) ... was permeated by a general air of depression. Most governments are having second thoughts over the extravagant funding which space activities demand, and many future plans have been shelved or are now in jeopardy." The European space effort was described by a high West European official as "being in a state of collapse", a Soviet spokesman "indicated that the USSR had encountered major difficulties in its manned space programme." The IAF Congress was given little coverage by the press, because, even though papers presented were proposing technologically sound space projects, they were not realizable due to the absence of space research funds. Practical uses of existing spacecraft, such as communications satellites, generated more interest, presumably because funds for these applications were available. Luigi G. Mapolitano, president of the IAF said of the Federation, "One major function of the IAF is to boost up space wherever it is low-keyed, as it seems to be now everywhere. Our role now is just to keep it alive".

229. Greenberg, D.S., "Space: Europe Makes Move Toward Setting Up a Central Organization", Science, v. 162, no. 3858, December 6, 1968, pp. 1108-1109.

Science Ministers from 12 European Countries met at Bonn to discuss unification of Europe's space programs into a single European Space Authority. "Many meetings hence, the outcome may be a NASA-style organization encompassing the six-nation European Space Vehicle Launcher Development Organization (ELDO), the ten-nation European Space Research Organization (ESRO), and the 12-nation European Conference on Telecommunications Satellites (CETS). Whether this will actually happen, and, if it does, whether it will involve anything more than organizational

shuffling, is not at all certain." The 3-day meeting resulted in the discussion "that Europe will work toward the creation of a comprehensive space organization, but member nations will be free to choose the programs they want to support." There is disagreement on whether or not to use "American-produced rockets" and "an American-manufactured international communications system". American "prowess in space permeated all the deliberations, and it appears that if anything can push Europe into an effective space program, it is the vast and still growing strength of the United States".

230. "ELDO Fails Again", Nature, v. 220, no. 5171, December 7, 1968, pp. 945-946.

Budgetary problems are plaguing the Europa 2 launcher programme, a project under ELDO. "Britain is not going to be let off its remaining two year financial obligation to ELDO -- roughly £10 million -- without a struggle. The Minister of Technology made the ditching of the ELDO contribution a condition for Britain's 'whole-hearted participation' in the new space policy for Europe". "Whether Britain contributes its share or not is obviously a main consideration. Also uncertain is whether Italy will ... conform to the economy plan agreed by the other nations for completing the Europa 2 programme. French financial difficulties will not help ELDO's budgetary problems either. Fifty million francs had already been lopped off and the French space budget before the recent money crisis the additional budgetary economies that followed. France ... refused to contribute to the economic and technical studies on applications satellites ... estimated at $1 million. It is assumed that the budget for the studies will now have to be $800,000." The remainder of the article discusses the test failures of the Europa 2 programme.

231. Greenberg, D. S., "300 Gev: Europe Moves Closer to Getting Its Big Machine", Science, v. 162, no. 25, October 1968, pp. 440-442.

A crucial meeting of the European Organization for Nuclear Research (CERN) council on 2-3 October resulted in a new budget for the 300 Gev particle accelerator and new financial commitments by West Germany to push the new high-energy physics laboratory closer to reality. The design group's reworked plans reduced the cost from $408 million to $307 million; "80 percent of this revised amount was assured". "As things now stand, CERN's 300-Gev machine lacks a formal go-ahead decision, since the participating nations must each ratify a new convention for the accelerator laboratory ... On all sides, however, there is ample confidence that CERN is on the way to getting its 300-Gev machine, and plans are going ahead on the assumption that construction will start in the latter part of 1970."

232. "Science and Technology in Developing Countries", SSF Newsletter, v. 3, no. 6, October 1968, pp. 7-8.

"At its Third Session in January 1968, the Committee on Science and Technology in Developing Countries (Costed) of ICSU, had a discussion on co-operation with Unesco. Mr. de Hemptinne (Science Policy Unit, Unesco) explained the need for the creation of a roster of about 25 science policy consultants, who should be scientists or engineers who hold or had held posts in national policy bodies in advanced countries. On the feasibility of establishing an international institute of science planning, Costed agreed it would be better to make use of institutes already in existence, and supported the formation of an international panel available as consultants."

233. Bickel, L., "Squeeze on Private Research", Science News, v. 94, no. 21, November 23, 1968, p. 530.

Nongovernment scientists in Australia are facing a financial squeeze as defense spending in Vietnam and weapons research drains funds away from home government projects. "Three years ago the Federal Government began to drop its funding for university research from $17 million to $9 million over the three-year period, and has now just published its lowest funding for individual research for three years. Coincident with this is a marked falling away of public interest. Donations to medical foundations are shrinking, raising the threat of abandonment of long-term projects." Of the current Federal research funds of $150 million, the largest proportions are distributed as follows: $42 million goes to the Commonwealth Scientific and Industrial Research Organization (CSIRO), "which works mainly along lines of pay-off to the economy"; $30 million goes to weapons research, armed forces projects, the Woomera rocket range, and joint projects with the U.S. and Britain; $18 million goes into peaceful uses of atomic energy by way of industrial grants, science-study grants in schools, and individual project grants. President Johnson and his science adviser, Dr. Donald F. Hornig spent 8 days in Australia discussing joint science projects. The talks and surveys culminated in a 5-year agreement "to widen the flow of exchange workers in already-established associations and to create new areas where both nations can benefit". These areas include "joint projects in arid-zone research, weather modification and global atmosphere studies, new methods of mineral exploration and exploitation, and the location of underground water resources".

234. "Proceedings of The Special Committee on Science Policy, Phase I", The Senate, Canada, Second Session at the Twenty-Seventh Parliament, 1967-1968, Queen's Printer and Controller of Stationery, Ottawa, 1968, 328 pp.

Phase I of the three-part public hearings of the Lamontagne committee on science policy in Canada is presented in this document. The first phase of the hearings, held during March and April 1968, was aimed at "broad questions which must be answered as a prelude to determining the main elements of a dynamic and effective science policy". These include such topics as trends in R&D expenditures in Canada, activities of the Federal Government in R&D, federal assistance to R&D, and the "broad principles ... financial arrangements and structural organization" of a science policy for Canada. The hearings presented here include testimony from representatives of the Science Council of Canada, the Canadan Council, the Science Secretariat of the Privy Council, the Medical Research Council, as well as from individuals of Britain and the U.S.

235. "Deciding What to Do", Nature, v. 220, no. 5160, November 9, 1968, p. 523.

"The long-awaited report on Canadian science policy, just published by the Science Council in Ottawa, contains few surprises." It calls for applied science to be organized into major program areas, each of them "mission-oriented and multidisciplinary and each controlled by a body specially created for the purpose". Six areas are recommended: space, water resources, transportation, urban development, computer applications, and scientific and technological aid to developing countries. Once these areas are launched, attention would turn to planning six more areas: health services, development of the North energy sources, integrated source management, oceanography, and weather prediction and control. The council "does not attempt to estimate how much the programmes are likely to cost" but it does say that "the widely discussed target of 2 per cent of the GNP to be spent on research and development is over-cautious and will be surpassed". The report calls for a much larger role for industry in R&D: "Federal research programmes should be contracted out to industry, and government procurement should be used as a way of 'upgrading the technological level of Canadian industry'". A set of criteria for selecting new program areas was also proposed by the Council.

236. "Australian-U.S. Pact", Science, v. 162, no. 3853, November 1, 1968, p. 550.

"The U.S. government has signed a formal agreement, which extends existing cooperative technical exchanges with the Australian government and provides for additional sharing

of scientific and technical information, and faculty and student exchanges. The joint agreement was signed 15 October during a U.S. science Mission to Australia by the President's Science Advisor, Donald F. Hornig, and the Australian Minister for Education and Science. The National Science Foundation will administer the initial 5-year program for the United States."

237. "How Canadians Decide What to Do", Nature, v. 220, no. 5164, October 1968, pp. 218-219.

A brief description of Canada's organizations dealing with science and science policy is presented and reasons for Canada's failure to invest more in R&D are discussed. At present, there are two organizations to advise the government on Science and Science Policy: the Science Secretariat and the Science Council. The Secretariat -- "The focal point for scientific advice in the government" -- "is also responsible for most of the gathering of information which goes into the development of policy, and recommending the kind of organization Canadian science needs". Although it is difficult "to tell where one organization takes over from the other", the Science Council's task is to "get government scientists to take a broad national view". Suggested reorganizations for these two bodies are discussed. "Although there is argument about the organization of science in Canada, there is a wide measure of requirement [that] ... Industry must be persuaded to invest more in research". Canadian industry carries out only 41 per cent of the total research -- in 1965 "800 firms spent a total of $287 million, and thirteen firms accounted for half of this figure". Three reasons for this are given: "Canada has little secondary industry, and the primary industry is resource based, with little tradition of technological involvement. The population of Canada, only twenty million ... is too small to support many large firms, which tend to do more research. Finally ... foreign ownership is very important -- Canada is a horible example of how far foreign ownership and control can go in the absence of government efforts". The remainder of the article is concerned with a series of inducements which have been provided to encourage industry to do more research.

238. Gould, D., "Canada's Attempt to Harness Science", New Scientist, v. 40, no. 620, October 24, 1968, pp. 180-184.

"Canadian politicians have recently reorganized the urgent need to put science and technology to work in the national interest". "The planners have therefore decided that hopes for Canada's future financial stability must lie in the establishment of secondary industries, employing advanced technologies, and capable of providing high-valued manufactured goods which can compete successfully in world markets." Efforts to persuade businessmen to spend money

on R&D have met with indifference; in an attempt to correct this situation, the federal government is offering substantial tax concessions and grants. "To help direct this effort two new bodies have been created within recent years:" the Science Secretariat and the Science Council. The Science Council advises the government on the country's overall research activities, whereas the Secretariat searches out the information needed for decision-making and gives secretarial and general assistance. "Senator Lamontagne (chairman of the Senate Committee on Science Policy) feels that Canada's first need is to establish a far more effective means of collecting and spreading scientific information, including knowledge of experience gained overseas ... He hopes to propose the setting up of a Department of Science ... having three main divisions, concerned respectively with the life sciences, the physical sciences and the social sciences. After his committee has completed its hearings, he expects that it should be in a position to map out a course for the nation's future scientific effort."

239. "Canadian Phase-Out", Science, v. 162, no. 3853, November 1, 1968, p. 550.

"Studies for construction and operation in Canada of an intense neutron generator (ING) -- which would have been by far the largest and most expensive single scientific project ever funded by the Canadian government -- have been discontinued. The Science Council of Canada has requested that Atomic Energy of Canada Limited (AECL), a government corporation, phase out its studies because federal funds cannot be provided at this time. ING's aim was to produce an extremely high intensity of neutrons for basic research and the production of radioactive isotopes for medical, industrial, and other applications. ING was first submitted for government approval in 1966; it would have cost $143 million (U.S.), with yearly operative expenses of about $14 to $19 million, and would have taken 7 to 8 years to build."

240. "Taiwan Workshop Focuses on Industrialization", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, November 1968, p. 12.

A special 14-man National Academy of Sciences panel and nearly 40 Chinese met (under the auspices of the Sino-American Science Cooperation Program) for a week-long workshop on "The Industrial Development of Taiwan: Science, Technology, and Management". Workshop discussions focused on three themes: (1) "A techno-economic view of Taiwan, or interacting relationships between science and technology and the socio-economic environment", (2) "Measures, in the area of Sino-American cooperation, to accelerate the process of technological change", (3) "Taiwan's capacity to

generate, adapt, and absorb new technology in selected industrial sectors; problems and limitations as seen by Chinese industrialists, with emphasis on food technology, textiles, chemicals and plastics, electronics, metal, and energy needs". "Since the start of their collaboration in 1964, the U.S. and China committees have devoted attention to science policy planning, advanced education and research in the sciences and engineering, and other problems related to the strengthening of science and technology in Taiwan. Significant steps already taken ... include the creation of six doctoral training programs and the establishment of a top-level science planning and policy advisory mechanism".

241. "R and D Breakdown for French Industry", New Scientist, v. 40, no. 621, October 31, 1968, p. 234.

The Delegation Generale à la Recherche Scientifique et Technique recently published the results of an inquiry into the extent of R&D undertaken in French industry and how it is financed. "The report shows that 1145 firms and 43 professional organizations declared that they had carried out research and development work in 1966. The total expenditure on R and D of these 1188 enterprises amounted to 5850 million francs ... an increase of 13.7 per cent compared with 1965. The overall expenditure on R and D represents 3.3 per cent of the total turnover of the firms included in the inquiry ... The state finances 37.6 per cent of French industry's expenditure on R and D. State contributions go mainly to the aerospace industry (84.5 per cent), the electrical and electronic industries (34 per cent) and the mechanical construction industry (28 per cent). The average expenditure per research worker increased from 240,000 francs ... in 1965 to 254,000 francs in 1966, an increase of something over five per cent. The number of research workers and engineers employed on R and D work in industry totalled 23,000 full time equivalents, an increase of 5.5 per cent over 1965. The total number of workers of all kinds ... equaled 102,500 full time equivalents in 1966."

242. "20 Percent Growth for German R&D", Scientific Research, v. 3, no. 22, October 28, 1968, p. 23.

"West Germany's Ministry of Science has revised its projected growth rate for r&d upward -- from 6 percent to 20 percent annually for 1970, '71, and '72. By 1972, when the nation is scheduled to spend 3 percent of its GNP on r&d, the Ministry expects to have a $1-billion budget. The science ministry's 1969 budget will be $544.75 million, a 13 percent increase over 1968. The largest share of this budget will go toward expansion of

Germany's universities and to nuclear research. The universities will get $182.5 million, $25 million more than they received in 1968. Nuclear r&d will get $182 million, an increase of $16 million over this year's budget. The rate of German growth in science budgets is unique in Europe."

43. "Germany Spends More on Space", Nature, v. 220, no. 5171, December 7, 1968, pp. 954-955.

Germany's intentions of becoming a space power are evident from increased federal support to the national space program. "Germany's Federal Ministry for Scientific Research, headed by Dr. Gerhard Stoltenberg, is very conscious of the economic value of applications satellites in communications, navigation, air traffic control and meteorology, and believes that Europe must make strong efforts to become an active participator in these areas ... Although nobody in Bonn admits it, the accent on space technology is not only a well planned exercise to reap the benefits of applications satellites, but is also an insurance policy against a political situation which, seen from Germany, is precarious." What Germany's overall space program will actually be is not as yet clear. Examples of the current individual projects and plans are as follows: research-satellite Azur to investigate the inner Van Allen belt, and a solar probe (Helios), jointly launched with America to explore solar plasma and interplanetary matter. "Exactly what kind of space programme West Germany plumps for in the end -- whether national, bilateral or multilateral -- depends on what comes out of the melting pot of ESRO and ELDO."

44. "Germans Step Up Ocean Research", Scientific Research, v. 3, no. 24, November 25, 1968, p. 19.

"West Germany is becoming a world leader in oceanographic research. In recent weeks it successfully tested its first undersea laboratory, a two man capsule built and owned by Deutsche Babcock & Wilcox AG but placed at the government's disposal. This fall, in another sign of the importance the government is placing on undersea research, it established an advisory Commission for Oceanography chaired by the federal Minister of Science, Gerhard Stoltenberg. The Commission's principal task will be to determine the country's oceanographic objectives and create a comprehensive program for achieving them." ... "A larger and more expensive undersea capsule, the Helgoland, built under a $250,000 contract from the Ministry of Science, is scheduled for its first submerged tests in the North Sea off Helgoland Island late next summer ... It will be used for joint research in

oceanography and medicine by the Helgoland Biological Institute and the German Institute for Air & Space Research."

245. "Concentrated Research at the Universities", Science of Science Foundation Newsletter, v. 3, no. 6, October 1968, p. 3.

To remedy the division between research and teaching at German universities ("both have grown to such an extent that research threatened to migrate from the universities"), "the Scientific Council has recommended that specialised research fields be defined". Additional funds will be provided for the specialized research fields, which means that (a) "it will no longer be possible for each university to distribute its work uniformly over all fields", and (b) "fundamental research activities required for teaching purposes must be maintained at each university". A list of 141 specialized research fields, in which work is actually under way, has been submitted. Decisions as to which of the fields registered by the faculties should be recognized as specialized research fields have been difficult; co-operation "beyond the work of the individual institutes, faculties or universities has been a primary criterion". "Five million German marks are available under the 1968 Federal Budget for financing specialised research programmes; only some of the Lands have provided corresponding funds. Besides the limited funds, the small number of special research fields is intended "to emphasis the experimental nature of the system and to supply an opportunity to devise particularly useful ways of promotion".

246. Kenton, J. E., "Hungary Modernizes Its Biological Research", Scientific Research, v. 3, no.25, December 9, 1968, pp. 41-43, 45.

A basic research institute in the biological sciences is being built in Szeged, Hungary, by the Hungarian Academy of Sciences. "The Center ... will house the Academy's institutes of biochemistry, biophysics, genetics, and plant physiology. About 60 percent of all Hungary's fundamental research will be carried out at Szeged ..." and "will bring together in one place related work now scattered around many locations in the country. The Center also represents a step away from the antiquated European system of organizing research around the university chair, traditionally a lifetime appointment". István Rusznyák, President of Hungary's Academy of Science, and Director of Budapest's relatively new Medical Institute, commented on one of the principal problems of the science administrator: "There are always people who expect science to provide an instant payoff ... Don't ask for more than that the scientist devote some thought

as to whether his work has any possibility of application." Regarding government allocations, Rusznyák observed, "If you estimate that 10,000 get involved in a science budget decision before it has worked its way up through the Academy, through the Parliament, and a clear concensus is arrived at, your estimate may be low."

247. Griffin, S., "Sea-Bottom Combines", Science News, v. 94, no. 24, December 14, 1968, p. 606.

Leading Japanese enterprises in trading and shipbuilding are pooling resources in an effort to exploit the potential industrial opportunities of marine resources. Plans include "utilization of the energy in seawater itself, development of submarine natural resources, and even utilization of oceanic space for recreational purposes such as aquatic parks". The Federation of Economic Organizations has been formed to guide basic research projects that are joint efforts of government and private enterprise. "The government is also preparing to launch a large-scale oceanic development plan, lasting at least five years, in the upcoming Japanese fiscal year, which begins next April 1. The plan, under the Oceanic Science and Technology Study Council, is aimed at coordinating the projects and proposals of a variety of concerned government agencies. The U.S. proposed International Decade of Ocean Exploration, which Japan "staunchly backs", "could well act as a focus for divergent efforts".

248. "Mexicans Building Optical Observatory", Scientific Research, v. 3, no, 24, November 25, 1968, p. 24.

"The National University of Mexico has started construction of a $1.2-million optical observatory in the San Pedro Martir mountains of Baja California ... for operation in 1970. Although Mexico has only 10 astronomers, it leads Latin American in astronomy -- and the new observatory is meant to help it maintain that lead. The observatory will have two telescopes: a 60-inch one with an aluminum reflector, designed at the University of Arizona; and an 83-cm one (about 32 inches), designed and built in Mexico. ... The 60-inch telescope ... is already in use at that university's Catalina Observatory just outside Tucson. It will be moved to the San Pedro site and operated by the two universities. ... The other telescope at San Pedro will be the first designed and constructed in Mexico. ... National University, through the Mexican Astronomy Institute, already operates an observatory near Mexico City, but meteorological conditions and increasing problems with light interference from the urban surroundings prompted the university to move its entire astronomy program to San Pedro."

249. "Sweden's R&D Up", Industrial Research, v. 10, no. 11, November 1968, p. 33.

"Spending on research and development in Sweden in 1968 is likely to exceed $400-million, according to a government survey. Government and private industry each account for about half of total R&D expenditure. Foreign financed R&D makes up less than 1% of this total. Top industrial R&D priority is being given to electrical engineering, mechanical engineering, and chemicals, according to a survey made by the Central Bureau of Statistics. Some 25% was undertaken by electrical products manufacturers, 19% by aircraft manufacturers, and 4% by pharmaceutical concerns. The number of researchers is about 20,000, putting Sweden close to the top in Western Europe. According to statistics, Sweden had 22 researchers per 10,000 inhabitants, compared with 11 for Britain, 6 for West Germany, and 4 for Italy. In terms of R&D expenditure in relation to gross national product, Britain spent 2.3%, Sweden 1.5%, West Germany, 1.4%, and Italy 0.6%. As a comparison, U.S. expenditures for R&D was 3.3% and the number of researchers was 24 per 10,000 inhabitants."

250. "International Movement of Personnel", Science of Science Foundation Newsletter, v. 3, no. 6, October 1968, p. 3.

"The Committee on Research Economics at the Swedish Atomic Research Council and the Swedish Natural Science Research Council have had published Report No. 34, 'The Number of Persons with Higher Education in Sweden Immigrated from Abroad'. It is a study prepared as a request by OECD to its member countries. It shows, based on the 1960 census, that Sweden has a comparatively great number of immigrants among people with higher education: 11.5 per cent of the total number of individuals in Sweden with university education, and 14.8 per cent of individuals with higher degrees (PhD). For natural scientists and engineers the figures are 13.5 per cent and 19.0 per cent (PhD). The equivalent figures for the USA are 7.0 per cent and 11.5 per cent (PhD)."

251. "Searching for a Science Policy", Engineering, November 22, 1968, p. 752.

Science and technology was the subject of a recent Conservative party seminar in London: "The biggest political question facing the UK is why she only gets one-third the output from each man that the USA gets". Other questions raised included the following: "Was the UK getting value for the £ 1000M she was currently spending annually on research and development? Was the way the £ 1000M divided between industry, government establishments, and the universities correct? ... Were the universities

producing the right sort of people for industry? ... How could a better rapport be generated between the universities and industry?" Causes for the output discrepancy between the UK and the USA were discussed and included "plenty of criticism, both direct and implied, of the government (whatever the party) and politicians": "Constantly changing objectives of governments ... bedevilled the nationalized industries until their managements became ineffective"; "inability of the country to integrate R&D with production and marketing"; "too much science for science's sake" in the universities; "there had to be a greater need for the research that was done". To help home industry, "public procurement by government departments and nationalized industry was strongly suggested.

52. "White Paper Time ... But Beware of the Status Quo", Technology Review, v. 71, no. 2, December 1968, pp. 2-3.

Three recently published British "White Papers" regarding the state of scientific research and development in government, industry, and universities are reviewed. The papers include the Jones Report on "The Brain Drain", the Dainton Committee report on science education, and the Swann Report on the employment of scientists, engineers, and technologists. The diagnoses of the specific problems and the recommendations in each report are reviewed and discussed. "They have correctly perceived a serious disease of British higher education ... And their recommendations are not merely a recipe for tackling an immediate practical problem ... They are concerned with reforms which could in due course have quite surprisingly far-reaching and positive social effects". "... but so far it is difficult to find any major government action on any of it, however authoritative the authors of the reports may be and however depressing the picture they reveal ..."

53. "Technological Innovation in Britain", Science of Science Foundation Newsletter, v. 3, no. 6, October 1968, pp. 3-4.

"This report to the Prime Minister of the Central Advisory Committee for Science and Technology ... points out that although Britain is responding vigorously to the challenge of world technological and commercial competition, the challenge is formidable, and ... calls for bold changes to meet it." "The council recommends five main objectives to be achieved. These are: the direct linkage of research and development, production and marketing into a single inter-acting operation; planned programmes of innovation related to market opportunities; management which is not only effective technically but is also market-oriented; the ability to achieve short lead times between the start of a new project and the marketing of the initial

product; a balanced use of scientific and technical resources over all stages of the innovative process". "The Government can help by encouraging new graduates in science and engineering to enter the management of industrial operations; by making loans and grants to small firms to improve production methods and exploit promising projects; and by encouraging firms of all sizes to buy royalty rights from overseas when appropriate in order to release scarce manpower for the later stages of the innovative process." The report ends: "What we have to achieve is a new balance of the deployment of our technological resources ... whether derived from our own inventions or brought in on a royalty basis ... nurtured into the final phase of marketable products".

254. "New Burdens for Science Research Council", Nature, v. 220, no. 5164, October 19, 1968, pp. 216-217.

Britain's Science Research Council (SRC), despite criticism of the British Government for its withdrawal (against SRC's advice) from the CERN project, is "in agreement with the Government and the Swann Committee over the general policy of increasing preferentially support to applied research". SRC's general policy review resulted in the discussion "that although it will continue to support research on a broad front it will concentrate on work likely to yield the most significant scientific advance or to be the basis of social and economic benefit to Britain. This will mean ... a more selective approach to financing basic research and postgraduate training". "At the same time, the Council is going to increase support for applied research at the expense of pure research, although most of its money will still go to pure research." The SRC will also "give more emphasis to its various scholarship schemes for encouraging movement between the universities and industry"; "use its one year post-doctoral fellowships in an attempt to reverse the brain drain to North America "; "encourage an increase in the number of advanced courses directly relevant to industrial needs"; and change the balance of support among the disciplines -- "astronomy is to receive high priority while support for nuclear physics will be run down".

255. Greenberg, D. S., "Basic Science: British Policy Aiming at Quality Plus Utility", Science, v. 162, no. 3854, November 8, 1968, pp. 652-653.

The 1967-68 annual report of the U.K.'s Science Research Countil (SRC) is reviewed and discussed. SRC is a new organization that is part of the Department of Education and Science. It is the prime source of money (current budget of over $90 million) for academic research, "and

virtually the only source of support for ... high-energy physics, astronomy, and computing". The policy expressed by the report aims at "squeezing basic research so as to emphasize scientific quality while at the same time pushing more scientific talent and effort into work that is related to utilitarian purposes". Funds for research, the Council says, will be proportionate 'with the university science population as a whole, even though the output of graduates and postgraduates is initially increasing more rapidly'. To get more applications of pure research, SRC intends to devote 'a small but significant part of its intramural resources' 'on training relevant to industrial needs'. The Council indicates that areas of priority for funding are astronomy, applied mathematics, computing science, plasma physics, enzyme chemistry, control systems and polymer and material sciences. The U.K. rationale for the support of basic research is briefly discussed, as is the decrease in the number of students entering the sciences.

56. "How to Lose the Technological Race", The Economist, v. 229, no. 6530, October 19, 1968, pp. 61-62.

While it is claimed that Britain has a substantial record of achievement in pure science, the British have suffered a low economic growth rate in recent years. There is "a very close correlation between a country's rate of growth and the proportion of its science and technology graduates who are technologists ... There is no such close relationship between economic growth and the total number of technology graduates; which suggests that it is the ability of technology to attract recruits in competition with science which is the significant thing". A systemic study of the problem (Ernest Rudd and Stephan Hatch, Graduate Study and After, published by Weidenfeld and Nicholson), presents some "striking" conclusions: "1. Twice as many postgraduates study sciences as study technology, ... 2. There is a very high rate of wastage among those postgraduates studying arts subjects, ... 3. The majority of postgraduates stay in the educational sphere and do not go into industry or commerce, ... 4. The tendency to stay in university and not go into industry is most marked among the best postgraduates, ... 5. There is the possibility that the brain drain from Britain may increase." Many reasons for these conclusions are discussed: the low status of technology and applied science and British society, the failure of industry to make itself attractive to graduates, the concentration of the best minds at the universities, and the ability of graduates to command better salaries outside of Britain. Discussion of the problems and causes are given in some detail. No solutions are presented, and the study indicates that remedial measures may have to be drastic.

257. "Swing Back to Science", Nature, v. 220, no. 5164, October 19, 1968, p. 211.

"Is the swing in the popularity of British university courses from science to arts and social science courses a continuing trend, or has the attention recently devoted to the problem been effective in arresting the swing?" The consensus seems to be that the situation has remained much the same as in the previous year: the number of applicants for science is about the same as last year, "and at least it is not decreasing as much as might have been feared". "There is even some evidence of a swing back to the sciences among school children now entering sixth forms." Quotas for entrance to science faculties in British universities seem to have been filled satisfactorily, and it is believed that science applications will not decrease severely in the years to come. Among the university courses in science and engineering, the latter are the least popular, while newer courses such as biochemistry and computer science seem to be increasingly attractive.

258. Ford, B. J., "Too Many Scientists?", New Scientist, v. 40, no. 621, October 31, 1968, pp. 257-258.

"One of the most prominent and absurd ... notions ... today is ... that we have a shortage of scientists. We do not, and it is ... time ... the realities of the situation were accepted." The "classic symptoms of a glut of qualified personnel" in Great Britain are described: "... there are large numbers of applicants for any post that becomes available, even if the conditions are poor. They pay is abysmal, incentives virtually non-existent and the intellectual rewards meagre." The author attributes this problem to the "qualification gap" -- "the disparity between the type of education and the needs of the graduate". Evidence submitted to the Swann Committee showed that "between 85 per cent and 90 per cent of British students leaving university are specialists ... actual requirements may be 20 per cent but are certainly not more than 40 per cent". "It is true the lucky few may aspire to senior posts, and the financial rewards of seniority in science are not inconsiderable. But at present the 'qualification gap' is enormous ... and, most important, society does not yet realize the paramount importance of the scientist -- where properly trained and efficiently employed -- in advancing the frontiers of safety, sanity and civilization."

259. "U.K. Launching Abstract Service", Scientific Research, v. 3, no. 22, October 28, 1968, p. 24.

"Britain is about to launch a computer-based physics and computer-sciences abstracting service ... called

INSPEC (INformation Service in Physics, Electrotechnology, and Control)." The system will begin operation in January, "turning out abstracts of all significant publications in physics, electronics, electrical engineering, control engineering, and computer sciences. It will be operated by the British Institute of Electrical Engineers, in cooperation with the British Institute of Physics, the Physical Society, the American Institute of Physics (AIP), and the U.S. Institute of Electrical and Electronics Engineers (IEEE.) Two German organizations ... plan to join the service later. The system is being financed by a $360,000 grant from the government's Department of Education and Science and by money from the participating societies ... Costs and charges for the service have not yet been worked out."

260. "Russians Steer New Course on R&D", Business Week, no. 2046, November 16, 1968, p. 115.

A new approach to Soviet R&D as been endorsed both by the Central Committee and the Council of Ministers. The redirection of research was prompted partly by a 2-year study of Russian R&D by V. A. Trapeznikov, first deputy chairman of the state committee on science and technology, and partly on the basis of D. M. Gvishiani's (Premier Kosygin's son-in-law) inspection of laboratories under his jurisdiction. Labs will be rated on "usefulness or salability of research", "novelty of research, number of scientific and technological proposals, over-all economic effect, and fulfillment of research contracts, not only with Soviet enterprises but with foreign countries as well". Labs and individual scientists will be rated periodically and given rewards or punishments on the basis of evaluations. "A new development fund will be created through diversion of part of the support that institutes now get for carrying out agreements with enterprises and from license sales. 'This fund will be an additional source of financing capital investments'". The redirection order "implies that all research labs will be treated equally, regardless of the type of lab or under whose jurisdiction it falls. This can only mean a major blow for the Soviet Union's Academy of Sciences".

261. "Science Pays Off", Science of Science Foundation Newsletter, v. 3, no. 5, August 1968, p. 7.

The economic profit of science in the USSR is reported by Academician Vadim Trapeznikov, a Soviet automation specialist. "... at present every rouble (100 kopecks) spent on the expansion of the national economy yields 39 kopecks in profit a year ... every rouble spent on the development of science and scientific research with their

results in production, brings 145 kopecks in profit a year". Trapeznikov suggests a 20-25 percent annual increase in appropriations for science -- which amounts to doubling appropriations every 3 to 3-1/2 years -- under the next 5-year plan (1971-1975). He also states that "the number of scientific workers in the Soviet Union has more than doubled in the past 7 years, to reach 750,000. About 60 percent of them are employed at research institutes and design bureaux; the remainder in teaching".